SERVICE MANUAL

B-3000

CAUTION

SEE SAFETY NOTICE ON INSIDE COVER SHEET

HOOO-006089

HAMMOND ORGAN COMPANY
A DIVISION OF MARMON COMPANY
A MEMBER OF THE MARMON GROUP OF COMPANIES
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SAFETY NOTICE

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To protect the user, it is required that all enclosure parts and safety interlocks be restored to their original condition and the following tests be performed before returning the product to the owner after any service operation.

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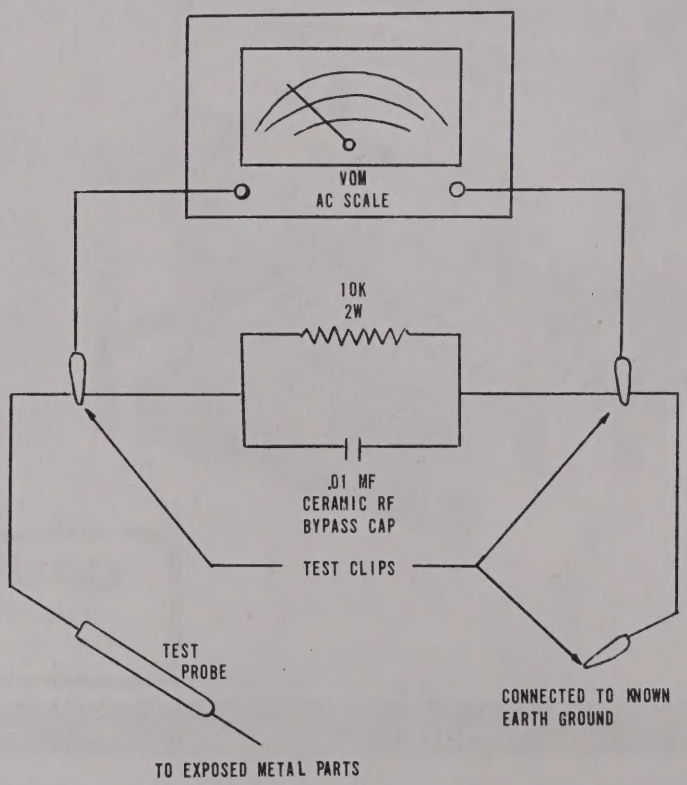

The HAMMOND B-3000

The sound that created the organ industry is eminently captured with the new B-3000. Innovative features blended with rich Hammond Tradition, assure the highest standard of excellence possible. Harmonic Tonebars featuring Variable Sustain combined with Independent Percussion and Piano Voices offer an exciting array of musical possibilities. Dual Channel amplification with In-Built Reverbèration and Leslie controls provide unsurpassed versatility. The model HL722 Leslie® speaker was designed exclusively for the B-3000. The beautiful string voices on the lower manual are highlighted with delayed Vibrato. "Key Click" provides the distinguishable "Hammond Sound" of years past. A VariableTransposer adds unique flexibility whether played professionally or center stage at home.

A transitionally styled pedestal design case compliments any setting. Acquaint yourself today, with the exciting features of the Hammond B-3000.

PRODUCT DATA SHEET

- **Custom L.S.I. multiplex synthesis technology**
- **Two 61-note keyboards**
  25 note pedal board
- **Harmomic Tonebars**
  Upper Keyboard: Two sets of 9 single harmonic tonebars

  Lower Keyboard: One set of 9 single harmonic tonebars, One set of 9 combination harmonic tonebars
- **Preset Keys**
  11 Preset keys plus cancel for each keyboard
- **Independent Percussion and Piano Voices**
  2nd and 3rd Harmonic Percussion, Percussion Fast, Electric Piano, Grand Piano
- **Pedals**
  16′ and 8′ Tonebars, Pedal Sustain, Pedal Mute
- **Variable Sustain**
- **Variable Reverb**
- **Reverb on Leslie**
- **Transposer**
- **Key Click**
- **Animation by Leslie®**
  In-built Leslie controls, Leslie Upper, Leslie Lower, Leslie Rotor (slow/fast) Vibrato On, Vibrato Slow, Vibrato Delay, Chorus On
- **Leslie Speed Control On Expression Pedal**
- **In-Built Sliding Music Desk**
- **Locking Cover** (optional)
- **Pedal Lamp**
- **Plug-in Jacks**
  Organ output for Leslie HL722 8 ohms Headphones, Auxiliary input jack
- **Dimensions**
  47⅛″ W, 39″ H, 28⅝″ D
- **Weight**
  263 Pounds including bench

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SECTION I
HOW THE ORGAN OPERATES

The features of the Hammond B-3000 have been patterned to capture the tonal quality and characteristics of the early B-3 Model. This section will briefly describe the various features of the B-3000.

1-1 MANUALS

The two 61 key manuals of the B-3000 are of single contact type. The manuals provide a means of keying the new generator keyer system of the organ. The manuals swing up to allow for easy access.

1-2 GENERATING SYSTEM

The generator system of the B-3000 utilizes the 440 custom L.S.I. divider/keyer package in a time sharing multiplex mode. The multiplex operation differentiates the B-3000 tone generation system from previous Hammond products.

1-3 TONEBARS

Two sets of nine tonebars per manual are used on the B-3000. These tonebar sets work from the A# and B preset (adjust) keys and provide means of selecting different footages and controlling volume. The lower manual "B" preset controls the lower Brite tonebars which, when selected, enhance "mellow" or "brite" pitches of lower voicing. The pedals utilize two tonebars of 16' and 8' pitches. They operate in the same manner as the tonebars.

1-4 PRESETS

A special set of labelled keys to the left of the manuals can be used to produce preset tones. They may be depressed individually or in groups, for arrangement of more complex tones. These presets are fixed and represent popular tonebar settings.

1-5 SUSTAIN

The upper manual incorporates sustain which is adjustable up to 3 seconds. Adjustment of the sustain control in the forward direction increases sustain time 0 to 3 seconds.

1-6 TRANSPOSER

The transposer provides a means of tuning the B-3000 two musical half-steps up and four down from the tuning standard of "A440". Movement of the switch, located at the lower lefthand endblock, allows tuning to the desired up or down steps.

1-7 PERCUSSION

The upper manual has 2nd and 3rd harmonic percussions as in the B-3. Depressing the "B" preset and 2nd or 3rd harmonic tabs, enables these percussive voices. The percussion fast tab decreases their decay time.

1-8 ELECTRIC PIANO

Depressing the "B" preset and Electric Piano tab enables the Electric Piano voice. Electric Piano can be used singularly or with the "B" tonebars and 2nd and 3rd harmonic percussion voices.

1-9 GRAND PIANO

Grand Piano is enabled by the depression of the "B" preset and Grand Piano tab. It overrides both 2nd and 3rd harmonic percussion and electric piano, but may work with the upper "B" tonebars.

1-10 PEDAL SUSTAIN AND MUTE

Depressing the pedal sustain tab adds 1 second of sustain time to any released pedal.

The mute tab gives the 8' pedals a more mellow tone by reducing harmonic content.

1-11 KEY CLICK

Depressing the key click tab playing any manual key produces "key click", like the one inherent in the old B-3. Key click does not function with the Grand or Electric Piano stops. It also does not function on pedals and lower manual "Brite" tonebars.

1-12 LESLIE UPPER, LOWER AND ROTOR

Leslie upper and lower tabs are used in conjunction with the special HL-722 tone cabinet. Depressing the Leslie on Upper tab switches the upper manual voices from stationary speaker to the rotating drum and high frequency horn of the tone cabinet. Leslie on Lower tab works in the same manner as Leslie on Upper.

The Leslie rotor tab is used for changing the speeds of the rotating drum and horn. The tab is a momentary switch and a separate LED pilot light will indicate fast operation.

1-13 VIBRATO

Depressing the "Vibrato on" tab adds vibrato to upper and lower manual voices. The Vibrato small tab reduces the vibrato width from wide to narrow. Delay vibrato works only on the lower manual. Depressing this tab provides a short delay before the vibrato effect is heard on the lower manual.

1-14 CHORUS

Depressing the chorus tab channels organ voices to both the rotary and stationary channels of the HL722 tone cabinet.

1-15 LESLIE ON REVERB

Leslie on reverb switch allows reverberation effects to be heard on the rotary channels of the tone cabinets.

1-16 EXPRESSION PEDAL AND KICK SWITCH

The expression pedal provides a means of controlling the over-all organ volume. Mounted on the left side of the pedal is a "kick" switch which, when activated, changes the fast/slow speeds of the rotary speakers.

1-17 HEADPHONE JACK

Under the lower manual, to the right, is the headphone jack. It operates properly with standard mono or stereo phones without adapters and silences the tone cabinet when used.

1-18 AUXILIARY INPUT

The auxiliary input located to the left of the headphone jack allows for input from other signal generating devices, such as synthesizers and rhythm units. It is under expression control and has an input impedance of 50,000 ohms. A ¼ volt RMS input signal produces full output.

SECTION II
THEORY OF OPERATION

B-3000

INTRODUCTION

The building blocks of the Hammond B-3000 consist of 8 basic areas. These areas concern:

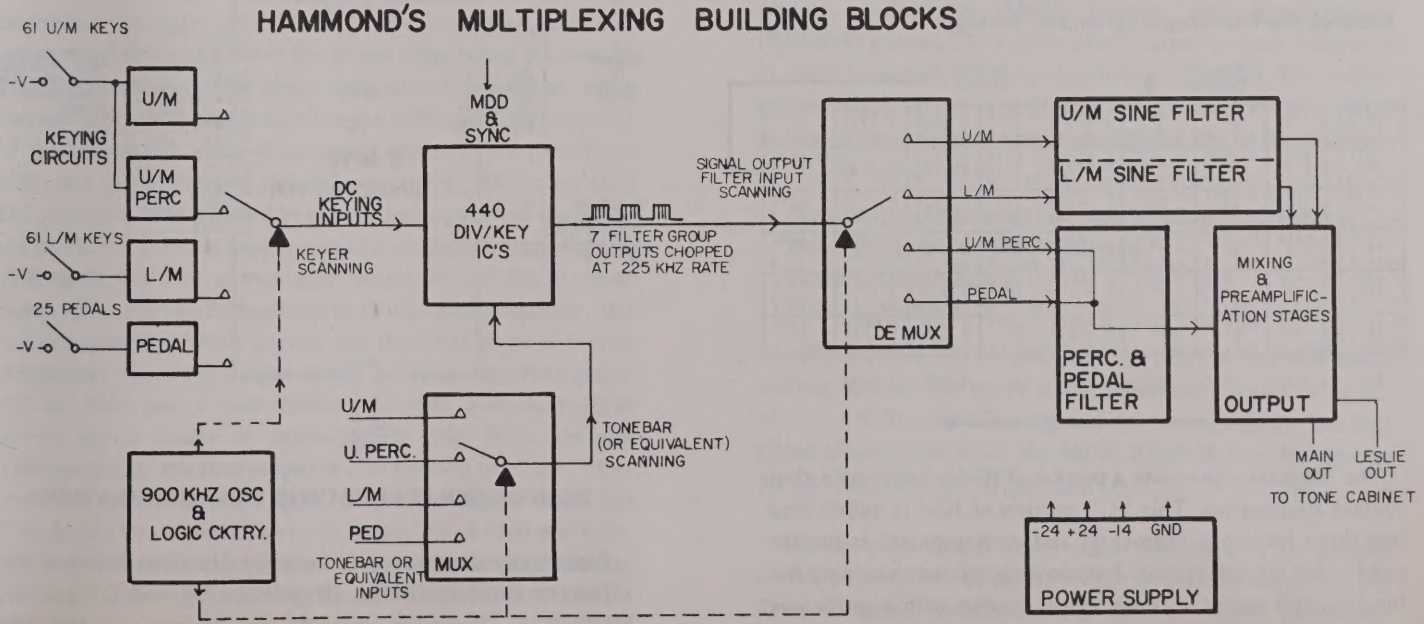
1) **Tone Generation**
2) **Timing Logic**
3) **Keying**
4) **Multiplexing (MUX)**
5) **Demultiplexing (DE-MUX)**
6) **Voicing Filters**
7) **Mixing and Preamplification**
8) **Power Supply**

Each of these areas perform a specific function in the B-3000's system operation. (SEE DIAGRAM) The following circuit descriptions pertain to operations of these areas. The schematic diagram (found in the jacket at the back of this manual) should be used in conjunction with this description.

TONE GENERATION

The B-3000 tone generation process occurs on the 440 Generator Board (12). Transistor Q6 and its Components form a Hartley Oscillator that operates at 1,604653 HZ. Transistor Q7 receives this signal and amplifies it to a level (14Vpp) sufficient to drive a CMOS load. The high frequency signal on the collector of transistor Q7 leaves the 440 Generator Board at J514 pin 3 and travels to the Transposer Board (16) where it is divided by 256 to provide a constant G note reference.

With the transposer switch set to the A440 position (in tune), the 440 Generator Board (12) receives a 1.88 MHZ signal at J514 pin 2. If the transposer switch is changed to an alternate position, the signal at J514 pin 2 also changes (increases or decreases) to correspond to the newly selected switch position. From J514 pin 2 the signal travels to pin 2 of IC-5 and performs a clock function. As IC-5 receives the clock signal, it produces the 13 top octave (MDD) frequency outputs in the range of low B to high B. The 13 top octave square waves leave IC-5 and flow to plug J513. From J513A the signals run to the Transposer Board (16) where they are

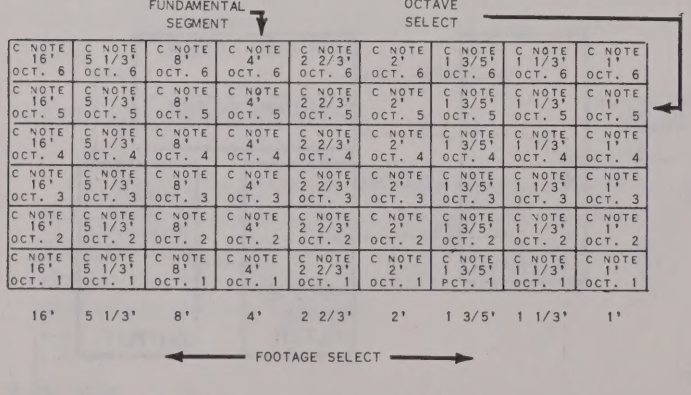


compared with the G reference frequency and changed by the phase lock loop of IC3 to the correct clock frequency for the position selected. Also upon leaving IC-5, the MDD frequencies enter a diode, resistor, capacitor network which serves two functions. First, the network reduces the 14Vpp MDD frequencies to 5Vpp, second the network allows a sync pulse to be imposed upon each MDD signal after each 256th cycle. The combination of MDD and sync on the same waveform is a unique characteristic of the 440 IC's. The MDD (square wave) portions of the 13 waveforms are used as top octave clocks for the four 075-000440 Divider Keyer IC's, whereas the sync (spike) portion of the waveforms are used to synchronize the fifth inputs to the 440 dividers. The following chart illustrates the transmission of MDD and sync throughout the B3000's 440 system;

IC-1 (NOTES D#, G, B)	IC-2 (NOTES D, F#, A#)	IC-3 (NOTES C#, F, A)	IC-4 (NOTES C, E, G#)
Fund. & 3rd D# MDD in and sync out Pin 11	Fund. & 3rd D MDD in and sync out Pin 11	Fund. & 3rd C# MDD in and sync out Pin 11	Fund. & 3rd C MDD in and sync out Pin 11
Fund. & 3rd G MDD in and sync out Pin 10	Fund. & 3rd F# MDD in and sync out Pin 10	Fund. & 3rd F MDD in and sync out Pin 10	Fund. & 3rd E MDD in and sync out Pin 10
Fund. & 3rd B MDD in and sync out Pin 9	Fund. & 3rd A# MDD in and sync out Pin 9	Fund. & 3rd A MDD in and sync out Pin 9	Func. & 3rd G# MDD in and sync out Pin 9
5th A# MDD in and sync in Pin 31	5th A MDD in and sync in Pin 31	5th G# MDD in and sync in Pin 31	5th G MDD in and sync in Pin 31
5th F# MDD in and sync in Pin 30	5th F MDD in and sync in Pin 30	5th E MDD in and sync in Pin 30	5th D# MDD in and sync in Pin 30
5th D MDD in and sync in Pin 29	5th C# MDD in and sync in Pin 29	5th C MDD in and sync in Pin 29	5th B MDD in and sync in Pin 29

With the application of MDD and sync signals (along with power supply voltage of -14V and ground) the 440's internally produce frequencies for all musical notes of the organ. In order to select and release particular frequencies, the 440 IC's require keying voltage inputs and footage control voltage inputs. Both the keying inputs and the footage control inputs can be either steady negative DC or pulsed negative DC. Together the two inputs provide a means of enabling particular frequencies at controlled amplitudes while, at the same time, preventing the release of other frequencies.

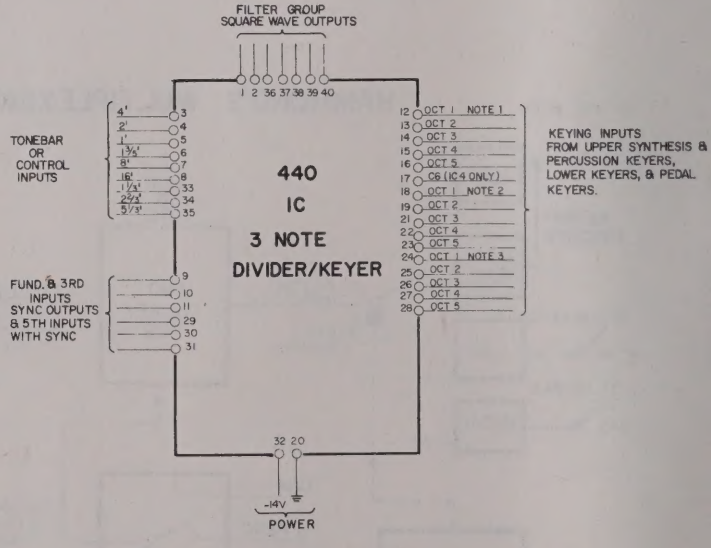
Operationally each 440 IC functions similarly to a matrix. Examine the following diagram and analogy:


FUNDAMENTAL SEGMENT
OCTAVE SELECT
C NOTE 16' OCT. 6
C NOTE 5 1/3' OCT. 6
C NOTE 8' OCT. 6
C NOTE 4' OCT. 6
C NOTE 2 2/3' OCT. 6
C NOTE 2' OCT. 6
C NOTE 1 3/5' OCT. 6
C NOTE 1 1/3' OCT. 6
C NOTE 1' OCT. 6
C NOTE 16' OCT. 5
C NOTE 5 1/3' OCT. 5
C NOTE 8' OCT. 5
C NOTE 4' OCT. 5
C NOTE 2 2/3' OCT. 5
C NOTE 2' OCT. 5
C NOTE 1 3/5' OCT. 5
C NOTE 1 1/3' OCT. 5
C NOTE 1' OCT. 5
C NOTE 16' OCT. 4
C NOTE 5 1/3' OCT. 4
C NOTE 8' OCT. 4
C NOTE 4' OCT. 4
C NOTE 2 2/3' OCT. 4
C NOTE 2' OCT. 4
C NOTE 1 3/5' OCT. 4
C NOTE 1 1/3' OCT. 4
C NOTE 1' OCT. 4
C NOTE 16' OCT. 3
C NOTE 5 1/3' OCT. 3
C NOTE 8' OCT. 3
C NOTE 4' OCT. 3
C NOTE 2 2/3' OCT. 3
C NOTE 2' OCT. 3
C NOTE 1 3/5' OCT. 3
C NOTE 1 1/3' OCT. 3
C NOTE 1' OCT. 3
C NOTE 16' OCT. 2
C NOTE 5 1/3' OCT. 2
C NOTE 8' OCT. 2
C NOTE 4' OCT. 2
C NOTE 2 2/3' OCT. 2
C NOTE 2' OCT. 2
C NOTE 1 3/5' OCT. 2
C NOTE 1 1/3' OCT. 2
C NOTE 1' OCT. 2
C NOTE 16' OCT. 1
C NOTE 5 1/3' OCT. 1
C NOTE 8' OCT. 1
C NOTE 4' OCT. 1
C NOTE 2 2/3' OCT. 1
C NOTE 2' OCT. 1
C NOTE 1 3/5' OCT. 1
C NOTE 1 1/3' OCT. 1
C NOTE 1' OCT. 1
16' 5 1/3' 8' 4' 2 2/3' 2' 1 3/5' 1 1/3' 1'
FOOTAGE SELECT

The diagram represents a portion of IC-4's keyer cells that contain frequencies. This "C" portion of IC-4 is subdivided into three harmonic segments, and each segment is further subdivided into basic cells. For convenience we show only the fundamental segment. Each cell is loaded with a particular frequency from a divider within the IC. Notice the frequencies within the cells are designated by musical note, footage, and octave number. As long as power, MDD, and sync feed the IC, these frequencies should exist. A matrix-like operation of the IC's occurs when particular cells are called upon to release their frequencies. The combination of footage control and octave keying inputs determine which cells are selected. For instance, if the first octave C key is depressed and an 8' tonebar (or tab) is selected, the matrix receives an address which selects a C note at 8' for octave one. The selected cell then releases its frequency to an output pin of the IC. All other frequencies are held back.

It is important to realize that in reality the address for the cell matrix consists of 6 octave keying inputs and 9 footage inputs. (See diagram of 440 IC). The keying inputs can range between -2.5V and -24V whereas the footage control inputs vary between -.6V and -14V. As either of the two inputs vary in amplitude, the level of signal released from the selected cell(s) changes accordingly. The more negative the input level, the higher the amplitude of the output signal from the cell.

The wiring arrangement of the 440 Generator Board ⑫ is such that the upper manual, upper percussion, and pedal keying inputs, enter the Generator Board at plugs J585, J586, J587, J588, J590, J590A, J591, J591A, and J592. At these plugs these negative DC keying voltages join the lower manual keying voltages (NOTE: the lower manual keying Time Constant circuits exist on the Generator Board(; they are then dispensed to the appropriate octave keying input pins (pins 12 through 28) of the 440 Divider Keyers. The footage control inputs enter the Generator Board at J511 pins 2 through 10. From these pins the voltages travel to the footage control input pins (pins 3 through 8 and 33, 34, 35) of the 440 IC's. The following diagram represents the pin functions of a typical 440 Divider Keyer Chip.



TRANSPOSER EFFECT UPON TONE GENERATION

Electrically the transposer circuitry functions between the reference oscillator/Buffer (transistors Q6 and Q7 and the MDD IC-5. These components are located on the 440 Generator ⑫. As the transposer switch position changes

(sharped or flatted), the clock signal applied to MDD IC-5 changes to a frequency that represents an exact musical step. Normally the transposer switch remains at the A440 position. Each position above or below this position represents an exact increase or decrease of half steps. Therefore, the possible frequency inputs of the IC-5 clock input can vary as follows:

TRANSPOSER POSITION	FREQUENCY INPUT TO IC-5 PIN 2 (APPROX)
4 Sharp (B Note Ref)	1.498 MHZ
3 Sharp (A# Note Ref)	1.586 MHZ
2 Sharp (A Note Ref)	1.680 MHZ
1 Sharp G# Note Ref)	1.780 MHZ
0 A440 (G Note Ref)	1.887 MHZ
1 Flat (F# Note Ref)	2.000 MHZ
2 Flat (F Note Ref)	2.119 MHZ

TRANSPOSER CIRCUIT OPERATION

At the Transposer Board (16) the 1.6 MHZ reference signal (from the 440 Generator Board) enters at J514A pin 3. IC-4, a 12 stage ripple counter, receives the signal at pin 10 and divides it by 256, producing a frequency of 6,268 HZ. This Square wave is distributed to two points. First, the signal feeds a divide-by-twelve stage yielding a 3,134 HZ frequency. This signal exits at IC-4 pin 12 and is used for the production of vibrato. Second the signal travels directly to pin 13 of IC-4, leaves the chip, and enters IC-3 at pin 14. IC-3, phase locked loop (PLL) compares the stable 6,268 HZ (G Note) signal with a selected MDD output note. The transposer switch and NOR gates of IC's 1 and 2 select the MDD that is to be compared with the G note reference at the PLL. Since each output of the MDD has a different division ratio the PLL output changes to keep its input and reference frequency difference to zero which changes the MDD clock (at its pin 4) to compensate. This causes the organ tuning to shift.

The PLL IC-3 contains a phase comparator and a voltage controlled oscillator (VCO). Both the reference and the selected MDD signals enter the phase comparator via pins 14 and 3 respectively. The phase comparator creates an error voltage (at pin 13) porportional to the difference in frequency of the two signals. The error signal enters a low pass filter (R23 and C9) to remove the AC component. The remaining DC voltage is then applied to the voltage controlled oscillator via pin 9. The error voltage forces the oscillator's frequency to shift until the two comparator input frequencies become equal. Once the two frequencies at pins 14 and 3 equalize, the error output pin 13 falls to zero and the VCO stops changing frequency. The VCO output at pin 4 leaves the Transposer (16) at J514 pin 2 and enters the 440 generator (12) at J514A pin 2 where it clocks MDD chip IC-5. On the Transposer (16) the IC-3 output is also applied to IC-2D. After inversion by IC-2D, the high frequency signal exits the Transposer Board and flows to the Logic (11B) at J540 pin 4. On the Logic Board the clock is used to generate the time sharing codes for the organ keying circuits and MUX/DE-MUX circuits.

The end product of the tone generation process is the production and selection of square wave frequencies. These selected frequencies are channeled into seven filter group bus lines which exit the 440 Generator (12) at J512 and travel to the De-Multiplexer circuits via the vertical interboard connnector pins. The following chart illustrates the distribution of notes on the filter bus outputs:

FILTER NUMBER	BAND OF NOTES	LOWEST NOTES
1	36	↓
2	9	
3	9	
4	12	
5	12	
6	9	
7	17	HIGHEST NOTES
	107 Total Available	

TIMING LOGIC

The overall purpose of the timing logic area on the B-3000 is to maintain the correct time sharing relationships between the organ's keying circuits, multiplexer circuits, and de-multiplexer circuits. The timing logic accomplishes this purpose in the manner described as follows:

The timing process begins with the application of the MDD Clock frequency to the Logic (11B) at J540 pin 4. With the organ in tune (A440) this signal exists at a frequency of 1.887 MHZ; repositioning of the transposer switch forces the appropriate deviations above or below this rate.

Upon entering the Logic (11B), the signal travels to IC-1A. Here the signal is shaped up and enters one-half of IC-2 which divides the signal frequency by two (943,360 HZ). The signal leaves IC-2 pin 1 and enters IC-3 pin 14 where it becomes the clock for octal counter IC-3 which, in turn, divides it by eight (118KHZ) and produces sequenced pulses for the organ keyer phases, multiplexer (MUX) phases, and demultiplexer (DEMUX) phases. Only every other output is used from IC-3 in order to provide a safety zone between phases. For clarity, these phases are labeled Phase A, B, C, and D. The phase designations represent time slots which refer to the enabling of the following systems:

Phase A-Upper Manual tonebars and Synthesis presets
Phase B-Upper manual percussion
Phase C-Lower manual
Phase D-Pedals

After inversion by IC's 4D, 5B, 5D, and 6A, the four phase signals operate the keyer clock generator circuits (IC's 4C, 4B, 5A, 4A, 5C, and 6D along with Q1 through Q12). The four phase signals also drive the MUX/DEMUX encoder circuits IC's 1B, 1C, 7A, 7B, 7D, 6C, and 1D.

The purpose of the keyer clock generator is to provide enable pulses to the 61 upper synthesis keyers (located on the Time Constant Generator (10)). The 61 upper percussion keying circuits (also located on the Time Constant Generator

⑩), the 61 lower keying circuits (found on the 440 Generator ⑫), and finally to the 25 pedal keying circuits (found on the two Pedal Time Constant Boards ⑭ and ⑮). It is important to note that the phase pulses enable all keying note circuits within a specific group at the same time. The groups of keyers are alternately enabled but the specific note circuits are inabled simultaneously. This distinction separates the B-3000 time sharing operation from other time shared organ Systems.

With Grand Piano and Electric Piano off, the keyer clock generator loads the upper manual output line (J537-7) with a combination of Phase A and B pulses, while the percussion line remains inhibited. With either of the two piano voices selected, allowing J541-22 to become grounded, the B phase becomes deleted from the upper manual output line and is transferred, instead, to the percussion output line. The action of IC4A controls the switching of the phase B pulses. The lower manual and pedal output lines are directly taken from phases C and D respectively. Both the C and D lines contain two buffers to equalize propagation delay times seen in the RC networks of the three transistor complimentary drivers (Q1 through Q12).

The three outputs of the MUX/DEMUX encoder circuit are termed A select, B select, and inhibit. When considered together, we will refer to these outputs as the ABI lines. The purpose of the ABI lines is to provide a sequential address code for the MUX and DEMUX ICs on the Multiplexer Board ㉛ and the De-multiplexer Board ⑰ . Because this address is timed with the phase A, B, C, and D pulses from the Octal counter (IC-3), it runs in sync with the keyer clock generator. This synchronization assures that the keying inputs, tonebar inputs (or equivalent), and filter group outputs of the 440 IC's occur in their appropriate time slots.

KEYING AREA

The keying of the B-3000 consists of 61 upper sustain and 61 percussion keyer circuits, the 25 pedal keyer circuits, and the 61 lower keyer circuits as follows:

61 Upper sustain (synthesis) Keyers-Time Constant Board ⑩

61 Upper percussion keyers-Time Constant Generator Board ⑩

25 Pedal Keyers-Pedal Time Constant Boards A and B ⑭ and ⑮

61 Lower Keyers-440 Generator Board ⑫

The purpose of these keyer circuits is to apply negative DC or negative pulsed inputs to the 440 Note Select input pins with the proper ADSR* characteristics and in the proper time slot.

UPPER KEYER CIRCUITS

Although there are two sets of 61 time constant circuits for upper synthesis and percussion, these circuits vary in component values and not in configuration. For this reason only the time constant circuits for key 1 synthesis and percussion will be discussed.

Referring to the schematic of the Time Constant Board ⑩ , the input for key 1 is seen to be J504-8. When key 1 is depressed, -24 VDC is applied across R73. R73 provides a load to trigger the upper manual legato detector and key down detector.

In the percussion time constant circuit, the -24VDC keying voltage is coupled as a pulse through C25, D74, and R76 to C26. R76 and C26 determine the keyer turn on time. R75, R76 and C26 determine keyer decay time by discharging back toward ground. The final voltage reached is the cutoff voltage which compensates for the later drops in Q17 and D77, and the keyer threshold voltage.

Q17 is a Darlington transistor which buffers the percussion voltage decay acting as a high impedance, high current gain amplifier. Q17 drives the generator IC keying input through R77 and D77. The output is J588A-1.

D76 is a multiplexing diode. A high frequency rectangular wave drive signal (from the Logic ⑪B) is applied as phase B. When the phase B input is at -24V, the drive from R77 passes through D77. When the phase B input is at ground, the drive from R77 is shunted to ground. This allows sharing of a single IC keying input between the two time constant circuits.

When the key is released, D73 shorts the positive-going pulse from C25, preventing storage of charge in C25 that may create malfunctions in rapid playing.

Turning to the sustain time constant circuit. When key 1 is depressed, -24VDC is applied through R78 and D78 to C27 and the base of Q18. The attack time is determined by R78 and C27. Q18 is again a Darlington transistor buffer. The Darlington drives the IC keying input through R81 and D80. D81 is a multiplex diode, this time controlled by phase A.

When key 1 is released, C27 discharges through R79, D79 and R80. R80 provides a slow decay toward a final cutoff voltage. R79 and D79 provide a rapid decay toward a sustain voltage from the sustain time control circuit, Q23 and Q24 on the Logic ⑪A . As Q23 and Q24 vary in their conduction status (because of movement of the sustain slider pot), they vary the amount of rapid decay, which, effectively varies the sustain time.

PEDAL KEYER CIRCUITS

The two Pedal Time Constant boards ⑭ and ⑮ contain the 25 pedal keyer circuits which are required to produce the polyphonic pedal sound. Individual circuits include a sustain capacitor, a sustain control bus, a Darlington buffer, and pedal multiplex diodes. Only key 1 will be discussed.

*ADSR = Attack, Decay, Sustain, and Release

When a pedal is depressed, the -24V pedal bus voltage is applied to the sustain capacitor C1 and the Darlington emitter follower. The 3.3K resistor and multiplex diode D2 prevent this voltage from entering the IC note select input until the negative phase D pulse is applied to the multiplex diode. Upon release of the pedal, the keyer voltage decays at an exponential rate to the cut-off (-1.75) voltage.

If the pedal sustain is off, (allowing the sustain bus to remain at ground) at the time of pedal release, C1 discharges through R1 producing a decay time of less than 5 msec. This decay is undetectable by the human ear. The movement of the pedal sustain slider, however, increases the level of negative DC voltage upon the sustain cutoff diode D1. This allows a pinch-off of the diode to various levels of sustain voltage. With the sustain slider at the maximum sustain position, the sustain time lasts approximately 1 second as C1 discharges primarily through a 5.6 meg ohm resistance.

LOWER KEYER CIRCUITS

The 61 lower manual keyer circuits are located on the Generator Board ⑫. These circuits contain a series of 3.3K resistors, multiplex diodes, and steering diodes. The circuits work similarly to the upper and pedal circuits discussed previously except the multiplex diodes pass keying voltage only during the phase C time slot. At all other times the lower DC keying voltages travel to ground and do not reach the note select input pins. Also, no sustain control or percussion control capabilities exist in these circuits.

THE MULTIPLEXER AREA

The 124-000520 Multiplex Board ㉛ serves two functions in the B-3000 Organ. One is to provide buffered, multiplexed drive to the generator tonebar inputs. The other is to provide demultiplexed bright wave signals for use in generating the lower manual bright wave tonebar tones.

There are nine multiplexers on the Multiplex Board ㉛. For simplicity, only the 16' multiplexer will be described.

IC-3 is a dual 4-channel analog multiplexer/demultiplexer. One of the four inputs, X0, X1, X2, or X3 is connected to the output, X, depending on the stages of control inputs A select, B select, and inhibit (ABI address). The other half of the IC operates in the same manner.

Each of the four X inputs is connected to a footage control line from either the Preset ⑤ or Control ⑧A. Each input represents a tonebar, preset, or percussive drive from upper, percussion, lower, or pedal circuits, to the generator IC's footage control input. The multiplex IC's allocate time slots to each of these inputs, according to multiplex phase address code of A select, B select, and Inhibit.

The inputs are static protected by input resistors and capacitors. for example, R4 and C11. In addition, the capacitors stabilize the inputs. The four phases are:

X0 - Upper Manual
X1 - Percussion
X2 - Lower Manual
X3 - Pedals

Q1 is the buffer for the 16' tonebar drive to the generator IC's. R22 provides a rapid turnoff between phases. R24 is a tonebar current sensing resistor. The current sensing voltage is fed through R25 to the bright wave gates, IC-1A, 1B, and 2B.

The brignt wave gates pass the tonebar current lower voltage to the Bright Wave Board ⑦B during the lower manual phase of the multiplex system. C1 through C5 demultiplex the bright wave signals by storing the sampled voltages until the next sample time.

When a ground is applied to J565-2, sections C and D of IC-2 are turned on. Section D passes -14V to the bright enable output, J565-5. Section C passes phase C (lower manual) to the bright wave gates. During the other phases, or when the bright control input is at -14V, R69 holds the bright gates off.

THE GENERATION OF FOOTAGE INPUTS TO THE MULTIPLEXER

Separate circuitry exists for the generation of footage drive inputs to the multiplexer IC's. These voltage inputs must maintain the correct DC amplitude or ADSR characteristics to allow the four basic subsystems to share the same 440 Divider/Keyer packages. It is, therefore, necessary to examine generation of footage drive for each of the four subsystems. These will be discussed in the following sequence:

1) Upper manual synthesis (X0 and Y0 inputs to MUX)
2) Upper percussion (X1 and Y1 inputs to MUX)
3) Lower manual synthesis and brights (X2 and Y2 inputs to MUX)
4) Pedal (X3 and Y3 inputs to MUX)

UPPER MANUAL SYNTHESIS

The footage multiplex drive for the upper manual synthesis tonebars (A# and B) along with the preset combinations begins on the Preset PWB ⑤.

With the upper A# or B preset (adjust) keys actuated, -14 volts DC travels from the upper preset busbar through the selected preset key contact, reaching the preset board at J522-1 or 4. The applied DC voltage activates sustain control transistors Q10 and Q11 enabling sustain if desired. The voltage also directly exits the Preset ⑤ at J522-2 or 3. From these pins the voltage reaches the A# or B tonebar assemblies wher it supplies the assembly with potential.

As the upper A# or B tonebars are adjusted for playing, the voltage divider action of the tonebar assemblies allow 9 selected voltage levels to enter into the Preset Board ⑤ at J524. After flowing through steering diodes, the adjusted negative DC levels drive emitter followers Q1 through Q9. The emitter outputs of these transistors, in turn, send the

footage drive voltages to the MUX X0 and Y0 inputs and, as a result of the MUX action, the 440 footage control inputs receive the negative DC levels (during Phase A) that correspond to the selected drawbar settings.

The presets other than A# or B operate in a similar manner to the A# and B. When any preset in the C# through A group is depressed, negative 14 volts is transferred to J522 pins 10 through 18 of the Preset (5). From any of these pins the DC travels through a voltage divider network that breaks down and feeds the voltage to the emitter-follower transistors Q1 through Q9. At this point the operation works identically to that described for the tonebar presets.

SECOND AND THIRD HARMONIC PERCUSSION

The formation of second or third harmonic percussion begins at the upper manual B preset (1). With the activation of the B preset, -14VDC is sent from the preset assembly to J522 pin 4 of the Preset Board (5). The voltage directly leaves the Preset Board at J526 pin 4 and enters the Control Board (8A) at J579 pin 12. Application of -14V at this point travels to switch IC1D, opening it between pins 10 and 11. Consequently, diodes D1 and D3 no longer supply a constant -14VDC to pins 6 and 5 of IC2C and IC2B. As a result ICs 2C and 2B become eligible for enabling by the activation of the second and third harmonic tab switches.

Now, with ICs 2C and 2B eligible for enabling, the selection of the second or third harmonic percussion switches supplies ground to IC2C pin 6 and IC2B pin 5. Ground potential at these points closes the switches allowing them to pass the -24V percussion "Plunk" pulse that arrives at J579 pin 24 with every keydown.

The generation of the "Plunk" pulse on the Logic Board (1A) occurs because of the action of transistors Q15 and Q16. Transistor Q15 functions as a keydown detector. During times of upper manual keydown the transistor conducts and allows nearly -24VDC to develope on its collector. When an upper key is initially depressed and Q15's collector instantly changes from 0V to -24V, RC network C20, R36, and R37 forms a negative -24V pulse. After differentiation by diode D7, the pulse drives the Darlington emitter/follower Q16. The emitter output of Q16 supplies J541 pin 12 with the "Plunk" pulse which is then transferred to J579-24 of the Control Board

If the ICs 2C and 2B (on the Control Board) receive the "Plunk" pulse on pins 9 and 4 respectively, and at the same time, receive ground at their control pins (6 and 5) from the harmonic tab switches, they pass the pulse to J568 pin 2 (4' out) and J569 pin 6 (2-2/3' out), From these pins the "Plunk" pulse flows to the X1 and Y1 footage inputs of the MUX IC's on the MUX Board (3I). Thus, during phase B time slots the "Plunk" drive is sampled and applied to the 440 footage controlled inputs. NOTE: It is important that the MUX sampling occurs quickly enough to impose nearly the complete "Plunk" waveform upon the 440 footage control inputs, for the proper attack and decay characteristics for the percussive effect to be felt at the 440's. This fact is critical to understanding Hammond's use of the Timesharing concept.

ELECTRIC PIANO

The activation of the Electric Piano stop applies ground potential to J579 pin 14 of the Control Board (8A). This potential performs four functions:

1) It supplies ground to J579-13 which is sent to J534-6 to close the synthesis gate IC1B in the Percussion and Pedal Filter Board (18).

2) It supplies ground via D9 to J579-7 which is wired to J541-22 of the Logic Board (1B). Ground at this point forces IC4A and 4B, to remove the phase B enable pulses from the phase A line (output of Q5 and Q6) and transfers the phase B pulses to the phase B line (outputs of Q7 and Q8). This inhibits the synthesis keyer circuits and enables the percussive keyer circuits during the phase B time periods.

3) It removes -14VDC from 1C1C pin 6 (8A). This closes 1C1C and connects pin 9 to pin 8. This action allows -14VDC to run through 1C1C and hold the 8' output line (J568-3) to a constant -14V level.

4) It removes -14VDC from IC1B pin 5 closing IC1B. With pins 3 and 4 of IC1B connected a plunk II pulse from J579 pin 15 can pass through IC1B and pulse the 4' output line at J568 pin 2.

NOTE: for functions 3 and 4 to occur the B preset must be pressed down and the Grand Piano switch must remain in its "OFF" position. If either of these two conditions do not exist, IC1C and 1B are held in their open states by IC1D or IC1A.

FOOTNOTE:

In reference to step 4 cited above the "plunk II" pulse is generated on the Logic Board (1A). On this board, Legato Generator Q13 and Q14 produce a negative pulse that feeds integrator circuit C13 and R22. When all keys are released, R17 and D2 reduce integration time. Darlington transistor Q25 is used as an emitter/follower for current amplification of this pulse.

GRAND PIANO

The selection of the Grand Piano tab allows the 8', 4', and 2' output lines on the Control Board (8A) to maintain staircased DC levels. Selection of the tab also inhibits the harmonic percussion and the electric piano circuitry on the board. The

enabling functions and the inhibiting functions of the Grand Piano circuitry will be discussed separately as follows:

ENABLING FUNCTIONS

With the Grand Piano tab chosen, ground is applied to J579 pin 6 of the Control (8A). the application of ground upon this pin is transferred, via D8, to J579 pin 7 which, in turn,passes the ground to Piano Control line J541 pin 22 of the Logic Board (11B) resulting in the enabling of the Percussive keyers during phase B time periods. The ground at J579 pin 6 from the Grand Piano switch also closes switch IC1A through diode D7 if IC1D is held open by the B preset. With IC1A closed, -14V is transferred through the switch and placed upon the 2', 4', and 8' output drive lines for the Multiplexer IC's. R12 and R13 reduce this voltage on the 4' and 2' outputs to produce an 8' staircase input to the 440's.

INHIBIT FUNCTIONS

The closure of switch IC1A provides inhibiting functions as well as enabling functions. The -14V at pin 2 of the IC forces the opening of switches IC2C, IC2B, IC1C, and IC1B through diodes D2, D4, and D10. The opening of the foregoing electronic switches assures the cancelling of drive for the 2nd and 3rd harmonic percussion and Electric Piano.

LOWER MANUAL SYNTHESIS C# THROUGH A# PRESETS

The lower manual C# through A# presets (6) allows the use of preselected synthesis tones in the organ system. The A# preset, when selected, supplies the A# tonebars with -DC Voltage via J522 pins 1 and 2 on the Preset Board (5). The tonebars then input negative DC to drivers Q12 through Q20 on the Preset Board. The C# through A presets, feed negative DC to preselected voltage dividers in the Preset Board, which maintain drivers Q12 through Q20 at their appropriate levels of conduction. For a more detailed description of the operation of Synthesis tonebars and presets refer to the description given for the upper presets and tonebars.

MELLOW AND BRIGHT - B PRESET

The depression of the lower B preset enables the lower B mellow and bright tonebars. The mellow and bright tonebars differ from the ordinary synthesis tonebars in that they (mellow and bright) contain additional harmonics for the production of string effects.

The process begins with the B preset. When the B preset is pushed down, -14V from the base of the preset detector, Q1 on the Bright Wave Board (7A) via J563 pin 2 is transferred to J563 pin 1. Q1, however, remains off as the input impedance of IC4A is very high. Consequently NAND GATE IC4B receives a 1-1 combination at its input pins 6 and 5. Thus, IC4B pin 4 maintains a constant logic 0 (-14VDC). The logic 0 from pin 4 of IC4B is inverted by IC4C.

The logic 1 (ground) output of IC4C leaves the Bright Wave Board (7A) at J563 pin 4 and enters the MUX Board (3D) at J565 pin 2. The ground at J565 pin 2 is distributed to the control pins (pins 5 and 6) of the C and D switches of IC2. This closes both switches. With IC2C closed the $\overline{C}$ enable pulse gates IC1 sections A through D and IC2 section B. With IC2D closed, -14VDC is placed upon J565 pin 5 which is then pased to the Preset Board at J527 pin 1.

As the negative DC enters the Preset Board (5) it fans out through diodes D87 thru D91 and feeds the lower 16', 8', 4', 2', and 1' driver transistors. Thus the MUX IC's continually receive full footage drive for the 16', 8', 4', 2', and 1'. With drive applied to them, the MUX IC's provide the 440's with selection inputs representing 16', 8', 4', 2', and 1' during phase C time slots. The current from the 440 16', 8', 4', 2', and 1', footage select lines developes a proportional voltage drop across R24 thru R28 which goes to the four electronic switches within IC1 on the MUX Board (3D) and the single B switch of IC2. The phase C enable pulses from IC2C gates the five switches on, and as a result, the five signals from the 440's footage select inputs travel to the Bright Wave Board (7B) for filtering.

PEDALS

Pedal drive to the MUX inputs occurs in accordance with the following description:

On the Preset Board (5) -14VDC supply is taped at J522 pin 9. This voltage is wired directly to the pedal tonebar assembly. As the two pedal tonebars are manipulated, a voltage divider network within the assembly allows a level of negative DC voltage to leave each tonebar. This level is porportional to the distance that each tonebar is pulled out. The 16' and 8' tonebar outputs travel directly to the Control Board (8A) at J579 pins 19 and 20 respectively.

As the 16' and 8' pedal tonebar drive voltages enter the Control Board, emitter/follower transistors Q1 and Q2 receive the voltages, and pass them base to emitter. The 16' emitter output of Q1 fans out to form drive for the 16' and 5-1/3' MUX lines. The 8' Q2 fans out to form drive for the 8', 4', 2-2/3', 2', 1-3/5' and 1-1/3' MUX lines. If 8' pedal mute is selected IC2D closes and opens IC2A removing the 2-2/3', 2', 1-3/5', and 1-1/3' lines.

The various MUX drive lines leave the Control Board (8A) at J568 and J569 and enter the MUX Board (3D). The drive voltages then feed the X3 and Y3 inputs of the MUX IC's.

DEMULTIPLEXER AREA

The seven frequency grouped output lines of the 440 IC's are shared by the upper synthesis, upper percussion, lower manual, synthesis and pedals. The function of the Demultiplexer circuits (located on the Demultiplexer Board

⑰ is to connect these signal output lines to the appropriate filters at the appropriate time periods. The following circuit information describes the operation of the Demultiplexer Board.

The multiplexed filter group output pins of the 440 IC packages are connected to J512A in seven groups. Each group contains four bands of audio frequencies impressed on much higher multiplex timing frequencies. The bass amplifiers Q1, Q2 thru Q13, Q14 amplify this information to a useable level for demultiplexing while presenting a very low impedance to the IC outputs to minimize crosstalk and intermodulation distortion. The outputs of these amplifiers are routed to IC's 1 through 4 each containing two analog one of four multiplexers. These packages act as time division sampling gates. These gates are driven by A select, B select, and Inhibit address present at IC's 1 through 4 pins 6, 9, and 10. The address determines which of the four output pins connect to the single input. Referring to the schematic, the "Y" section of IC1 is connected to the Q1 and Q2 bus amplifier. When the proper binary address is received at pins 6, 9, and 10, IC2 will connect "Y" to either Y0, Y1, Y2, or Y3 depending on the address. Capacitors C8-C11 serve as holding capacitors ensuring that the output signals stay fairly constant during samples. Q15, 16, and 17 are two-stage 18 db/octave high pass filters for IC group 7 only which contains the highest audio frequencies in the organ. These filters minimize any low frequency components (Aliasing) which may be present in the demultiplexed signal.

FILTERING

The seven different audio input lines to the Demultiplexer Board are sequentially channeled out to:

1) The Upper Sine Filter Board ⑲ during phase A

2) The Percussion Filter Board ⑱ during phase B

3) The Lower Sine Filter Board ⑳ during phase C

4) The Pedal Filter Board ⑱ during phase D

UPPER AND LOWER SINE FILTERS

Sine Filters ⑲ and ⑳ are used to convert square wave inputs to sine wave tones. Each sine filter PWB consists of seven thick film filter sections, each passing a band of notes as follows:

PART NUMBER	FILTER NUMBER	BAND OF NOTES
058-053691	1	1 - 36
058-053692	2	36 - 44
058-053693	3	44 - 52
058-053694	4	52 - 63
053-053695	5	61 - 72
058-053696	6	72 - 80
058-053697	7	80 - 96

A key click input is also provided at J545A pin 8 to mix the key click signal with the outputs of all the filter sections which are then bussed to an output mixing amplifier Q1.

PERCUSSION AND PEDAL FILTERS

PERCUSSION

On the Percussion and Pedal Filter Board ⑱ the second and third harmonic percussion as well as the Electric Piano utilizes the sine filter section of the board to convert the square wave inputs to sine wave tones. The filters consist of seven active-filter sections, each one with its own band pass. The combined range of the filters is 32hz - 7,900 hz. Q11 is the mixer preamp for the seven sections. Each section has a series RC configuration in the input to provide signal information for the Grand Piano amplifiers Q8, Q9, and Q10.

Four sections of the quad analog switch, IC-1, are used to switch the Percussion voices when IC1C is disabled by the UKB B preset. The switching occurs as follows: With Electric Piano control line (J534 pin 6) or Harmonic Percussion Control Line (J534 pin 7) grounded, IC1B closes. Thus, an output is present at C69. When Grand Piano control line (J534 pin2) is grounded, IC1A and IC1D close and IC1B opens producing no harmonic percussion output.

Percussive key click enters at J534 pin 10.

PEDALS

During phase D time slots six (group 7 is not used) groups of pedal signals are applied to the four passive pedal filters on the Percussion and Pedal Filter Board. After filtering, the signals mix and drive transistor Q14.

Transistors Q12 and Q13 form a preamp mixer for all percussion, pedal, and key click signals. The output of transistor Q13 leaves the Percussion and Pedal Filter Board J534 pin 11. From this point the signal travels to the output board for further processing.

LOWER BRIGHT FILTERS

On the Bright Wave Board (7B) the 16' through 1' signals are mixed, staircased, amplified, and filtered. The operation of all five filter sections is nearly identical, therefore, only that for the 16' will be discussed. The 16' bright wave signals are generated from 16', 8', and 4' square wave components, mixed through R1, R2, and R4, respectively. R10 adds a "thump" cancelling signal, to be explained later, to the stairstep components. C1 couples the stairstep into pin 9 of IC1. IC1 is a hex inverter operating in a linear mode. R11 establishes the DC gain and the operating point of the amplifier. C2 provides high frequency roll-off for stability and initial filtering.

The amplified signal from IC1D pin 8 is filtered and amplified into two tonebar voices, 16' mellow and 16' bright. The 16' mellow filter is a low pass filter consisting of R12, R13, R14, C3, and C4. The filtered signal is amplified by IC2C and coupled through R16 and C6 to the 16' mellow tonebar.

The bright signal is high pass filtered by R18 and C7, amplified by IC2, and coupled through R20 and C8 to the 16' bright tonebar.

As stated previously, the other bright wave pitches are derived in a similar manner although in the 4' and 2' circuits, the stairstepping is done after the first amplifier stage. This allows for mellow tonebar signals that start with square waves instead of stairsteps for a more mellow tone.

When pulled out, the mellow and bright tonebars mix the selected footages and return then to the Bright Wave Board (7B) at J562 pin 1 and the drain of N channel J-FET Q5. Because the -14VDC at IC4B pin 4 is also applied through R77 to IC-4D, IC-4D holds the gate of Q5 at a constant OV (logic 1) level. Consequently Q5 saturates and passes the lower bright audio out of the Bright Wave Board into the organ preamp circuits on the Output Board (23).

Important elements in the operation of the lower brights are the "thump" elimination and keydown circuits on the Bright Wave Board (7A). The lower keying bus is tied to P564-10 Depression of a key connects a load of roughly 3K from P564-10 to ground. This produces a drop in R88 sufficient to turn Q2 on. This turns Q3 on, resulting in application of -24V to the keydown output P654-9 and R91 turning Q4 on, grounding the audio enable line to the Output (23), if the "B" preset is on. C40 removes multiplex frequencies from the keydown circuit. The current through Q2's base emitter is, in turn, drawn through R81. The drop across R81 is amplified by IC-5. As additional keys are depressed, the increasing drop across R81 leads to voltage steps at the output of IC-5. These steps are injected into the thump cancelling resistors mentioned previously to cancel the DC components of the square wave generator inputs. R86 provides for adjustment of the size of the voltage steps.

THE OUTPUT PWB MIXING AND PREAMPLIFIER

On the Output Board (23) U/M signals are switched between main, Leslie, and vibato channels by the action of analog gate package IC1. With no ground applied to J533-7 (tab open), signals are routed through IC1A, IC1C, and to swell pedal diodes D4-D7. If vibrato is selected (ground at J533-5), signals are then routed through IC1D and to vibrato mixer Q14. If U/M Leslie is selected, signals are routed to IC1B and to Leslie swell pedal diodes D8-D11. With Leslie selected no signals will be routed to Q14, unless chorus is on. The L/M circuitry is basically the same as just described, With the exception of the bright switching circuitry. Bright signals enter the PWB at J532-11 and are amplified by Q2 and Q3. With bright control line J532-16 at ground (keydown) and synthesis control line J532-15 at ground, (preset enable), bright signals are routed to IC2, Where Main, Leslie, and vibato switching occurs. If J532-15 is at -14V potential, bright signals are canceled and synthesis signals are then routed to IC2.

Main and Leslie signals are gain controlled by current controlled attenuators. These attenuators are diode bridge constant voltage configurations, controlled by phase splitter Q4. A variable resistance at J533-12, from the swell pedal LDR, causes current flow through the diode bridge, creating a variable resistance. Q5 and Q6 provide amplification, and Q7 provides mixing for reverb output. IC5 and IC6 provide voltage and current levels necessary to drive tone cabinets and headphones. Vibrato circuitry employs a bucket brigade device driven by a high frequency voltage controlled oscillator which is driven by a 6.8HZ sine wave. The bucket brigade alters the delay time of signals passing through it, thus creating vibrato.

IC7 is a binary counter decoded to divide by 460. A 3,134 Hz square wave is provided from the transposer PWB and is used to clock the counter. The 6.8 Hz square wave output is routed to J592-1, and is used in the key click circuit. The square wave is also filtered by an RC filter into a sine wave for vibrato. Transistors Q11, 12 and 13 provide vibrato delay. Q17 provides +15 volts for the vibrato system.

IC11 provides Leslie speed latching. A ground at either J530-7 or 8 causes IC11 to change states. A +15 volt output at J530-6 indicates fast mode, and is also used to drive Q15, the LED buffer.

LESLIE CROSSOVER BOARD

The Leslie Crossover Board (26) is used to channel low frequency organ signals present in the Leslie channel to the main channel to prevent distortion due to inability of Leslie rotary speakers to handle low frequencies. The board interfaces with the Output Board. The Leslie channel input to J593-3 is split into two signals, one combining with the main channel signals and the other going to the Leslie channel preamps.

Q1 is configured as a low pass filter, with response determined by R5, R6, C1, and C2. Q2 is configured as a high pass filter, with response determined by C5, C6, R8, R9, and R10. The crossover frequency is approximately 110 Hz.

REVERBERATION DRIVER

On the Reverb Amplifier Board (21) the input signal is applied to input pins 6, 7, or 9. The input signal then appears across the summing resistor, R4. This signal is then coupled through C2 to a preamplifier stage comprised of Q1 and Q2. Transistor Q1 is a common emitter amplifier, which is used to increase the input signal level. Transistor Q2 is an emitter follower stage used to lower the output impedance of the first stage (Q1). Bias and feedback for Q1 are supplied thru R5. The output of transistor Q2 is coupled through C3 and R9 to the base of transistor Q3 which is a driver for the complementary symmetry low output impedance stage comprised of transistors Q4 and Q5. The output signal from transistor Q3 is developed across resistor R13 for transistor Q5 and across diodes D1, D3, and resistor R13 for transistor Q4. Diodes D1 and D2 are used to provide sufficient voltage drop to insure that, under quiescent conditions, both output transistors are conducting. AC and DC feedback are provided through resistor R11 for stabilizing the driver transistor Q3. Resistors R17 and R18 are used for current limiting and to ensure that the output stage operates as a class B amplifier. The output signal is coupled through C6, through the 8 ohm driver coil in the reverb unit, then appears across R16, 5.6 ohm resistor. The signal at R16 is coupled through R15 to the emmitter of Q1 and is used to provide negative feedback to Q1. This feedback is necessary, because the 8 ohm impedance of the reverb drive coil varies with frequency.

Through a reverberation unit there is considerable loss of signal strength. Therefore, the output of the unit must be amplified to restore the signal to sufficient amplitude to drive a power amplifier. The signal from the reverberation unit at J2-5 is coupled through C9, and R19 to the base of Q6. Bias and feedback for Q6 are supplied through R20. The output at Q6 collector is coupled directly to the base of Q7. The signal of the reverberation recovery at the emitter of Q7 is coupled to J1-1,2 through R24, reverb volume control, and C11.

POWER SUPPLY

On the Power Supply (29) input voltage of 120VAC is applied to transformer assembly 003-053915. Secondary voltage is present at terminals J518-10 and J518-12. A center-tapped bridge rectifier is used to obtain two outputs of reversed polarity sharing a common ground. Input capacitors C2 and C3 are the filter capacitors. Resistors R1 and R2 are bleeder-resistors. Input capacitor, C8, is required for the stability of the regulator. The positive voltage regulator is a three terminal device with fixed output voltage. This device features internal current limiting, thermal shutdown and foldback current limiting. Output capacitor, C4, is used to improve transient response. The negative voltage regulators are also three terminal devices and have the same features as listed above. The -24V is fed directly to the input of the -12 volt regulator. A voltage drop of the three diodes (D5 through D7) boosts voltage to approximately -14V out. As with the positive voltage regulator, the output capacitors have been used to improve transient response.

The power supply board also contains circuitry for tone cabinet switching. This circuitry consists of three sets of transistors. When +24 volts is applied to pin J519-3, Q5 saturates, thus providing ground for the tone cabinet at J519-4. With a positive voltage applied to J520-4, Q1 and Q2 are saturated, thus providing ground to Leslie fast relay at J519-6 and turning off Q3 and Q4. With no voltage at J520-4 the Q3 and Q4 are saturated providing ground for the Leslie slow relay at J519-5.

SECTION III
DISASSEMBLY PROCEDURE

To remove back panel and fold down panel:

1. Remove 3 Phillips screws from each side of the back panel. See diagram 1 for locations of the screws. This will expose the fold down panel.
2. Remove 2 wood screws from each side of the fold down panel. The panel will swing down, See diagram 2.

NOTE: When re-assembling back panel, use the two shortest hex head screws on the two bottom hole positions on each side of the panel.

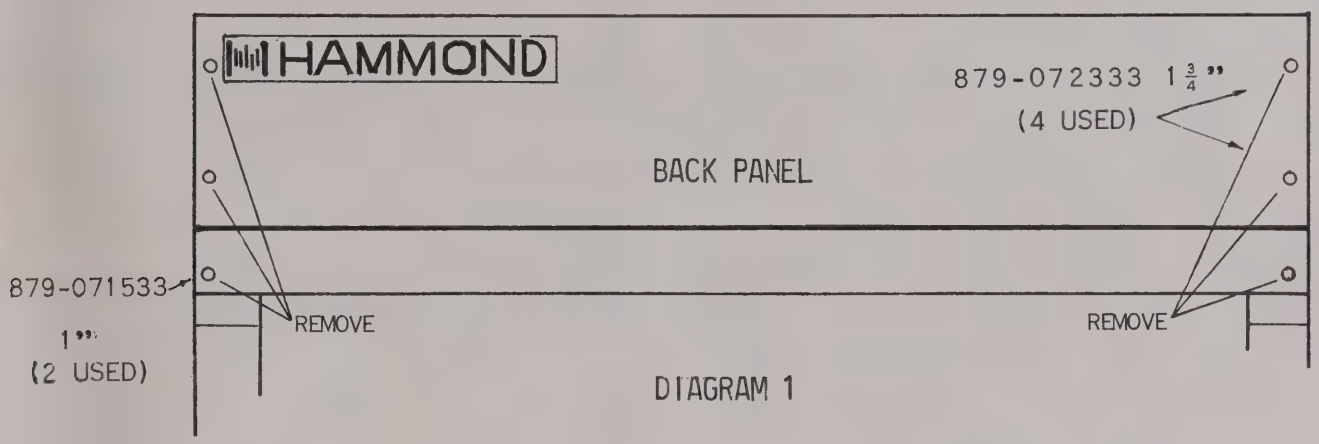


DIAGRAM 1

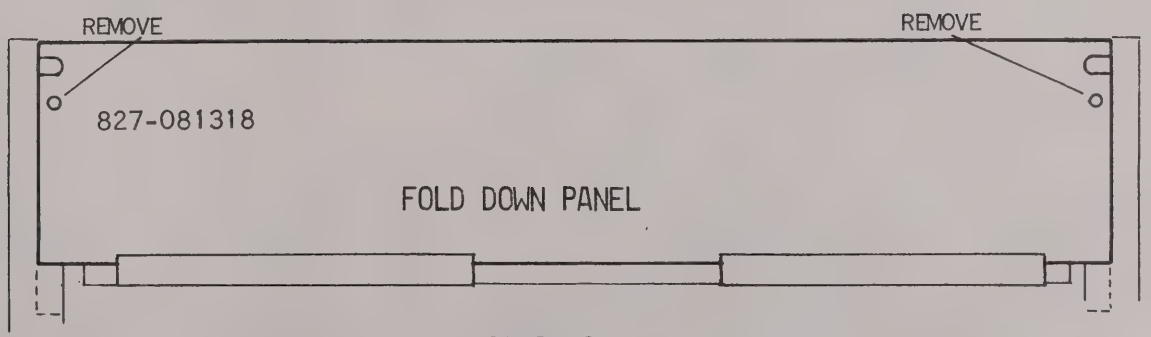


DIAGRAM 2

To Remove Top Panel and Music Rack Assembly:

1. Remove two ¼" hex head screws from the bottom of the cabinet support bracket. See accompanying diagram 3 for position and location.
2. Slide assembly forward approximately ½" to clear the keyhole plates on the filler blocks. Lift vertically, taking care that the music rack does not slide out of the top panel assembly. See diagram of filler block for additional information.

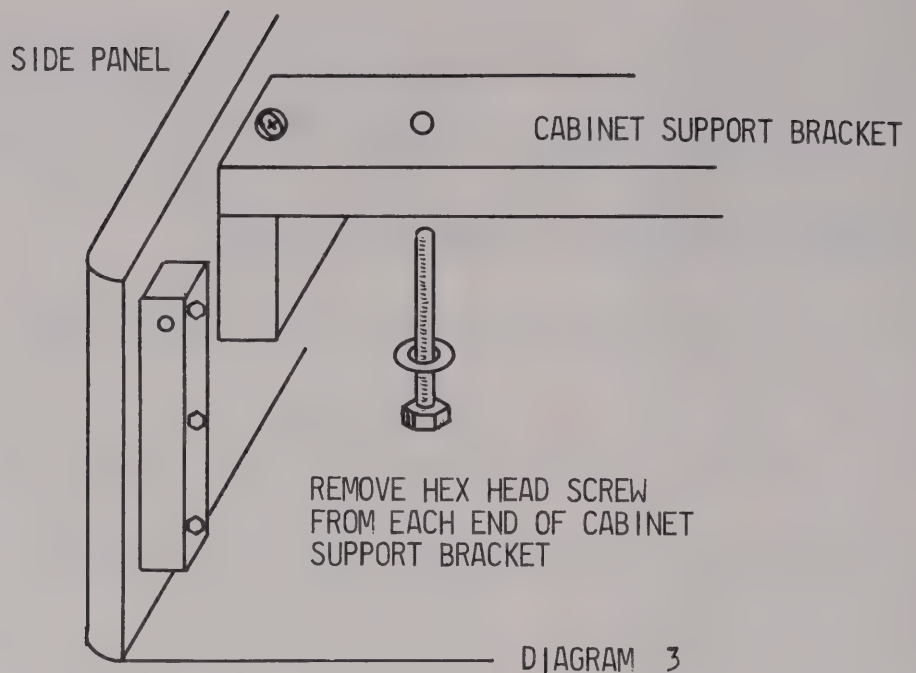


DIAGRAM 3

To Gain Access to Manual Assemblies:

1. Refer to diagram 4. for location of upper manual and lower manual hold down bolts. These are 3/8 " or 7/16" hex head screws which, when removed, free the manuals and allow them to be swung upward for access to keys, contacts, etc.

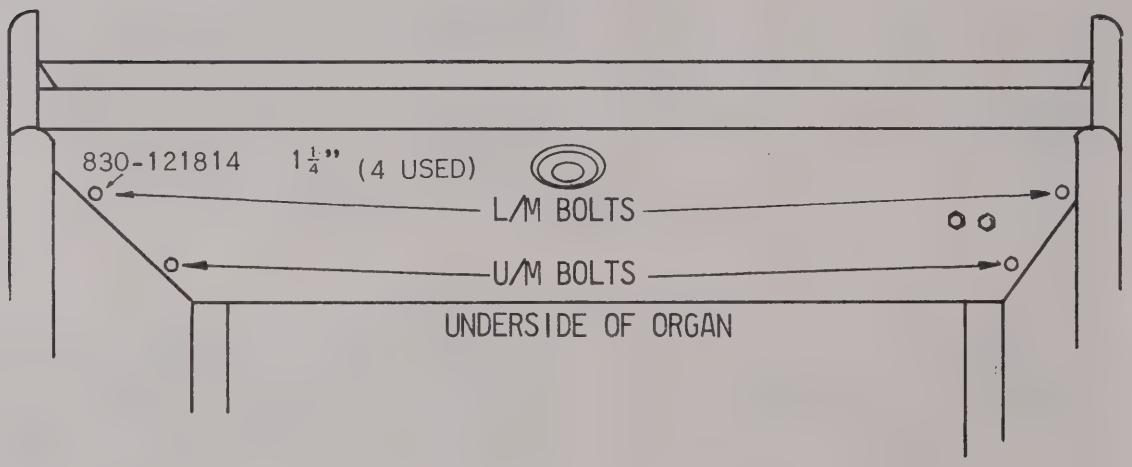


DIAGRAM 4

To Gain Access to Power, Pedal, and Leslie Cables:

1. Power, pedal and Leslie cabling is routed through the rear legs. Remove the leg bands from the upper and lower portion of these legs.
2. Remove the ground wire at the top of each leg cap.
3. Pull the leg cap free of the leg. See diagram 5.

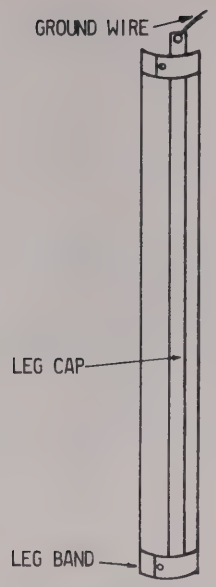


DIAGRAM 5

To Gain Access to Stop Switches and LED:

1. Remove hex head screws from the far ends of each filler block. See diagram 6 for location of these screws.
2. Pull out all drawbars and raise the upper manual stop switch base assembly.
3. At each end of the manual assembly are two hex head screws which secure the stop switch base to the upper manual. The location is shown in diagram 7 below. Remove these screws, one from each end of the assembly.
4. The stop switch base is now free of the manual assembly. Raise it up and note the position and location of the stop switch bracket. Six 3/16" hex head screws hold it to the stop switch base. Remove these screws.
5. Gently prying a screwdriver beneath the rocker tablet will allow the tablet to be pulled from the switch itself. The switch is removed by depressing the four retainer tabs holding it to the bracket. The wires to the switch should be removed first.
6. Removal of the LED should be obvious upon inspection.

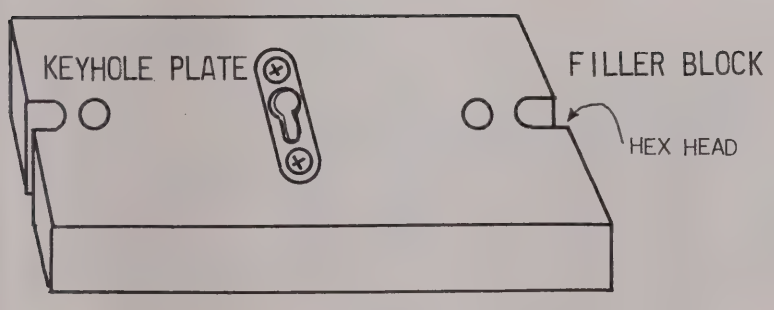


DIAGRAM 6

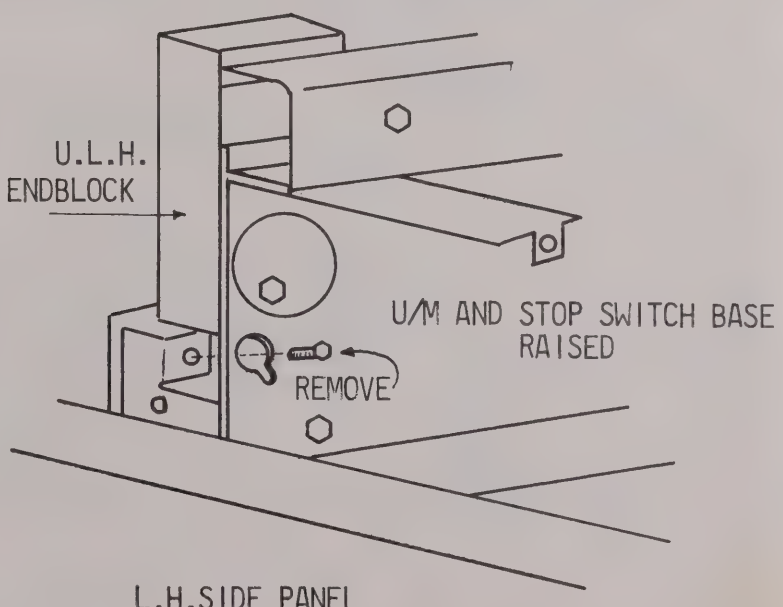


DIAGRAM 7

To Disassemble Stacked PWB Assemblies:

Should it become necessary to disconnect the stacked PWB assemblies, special disassembly procedures must be followed:

1. Rubber bumpers and screws hold the board edges to the shelf. Remove these first.

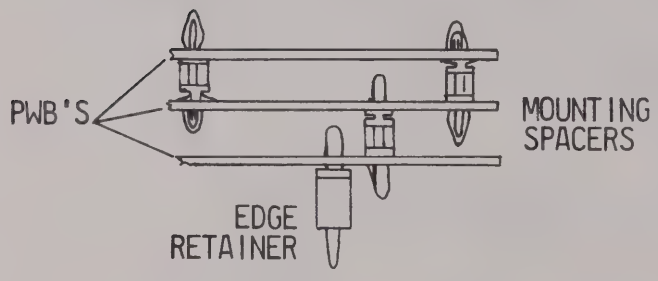
2. Remove all Molex plugs.

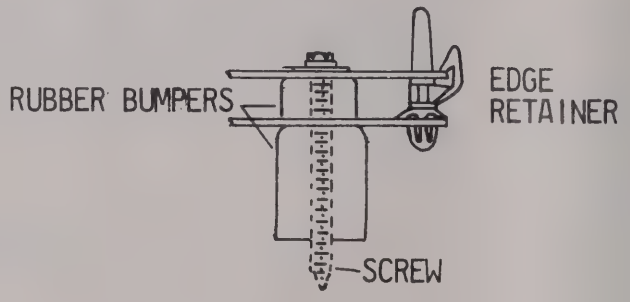
3. Pinch or squeeze the tabs on the mounting spacers and pull the board up just over the tops of the spacers.

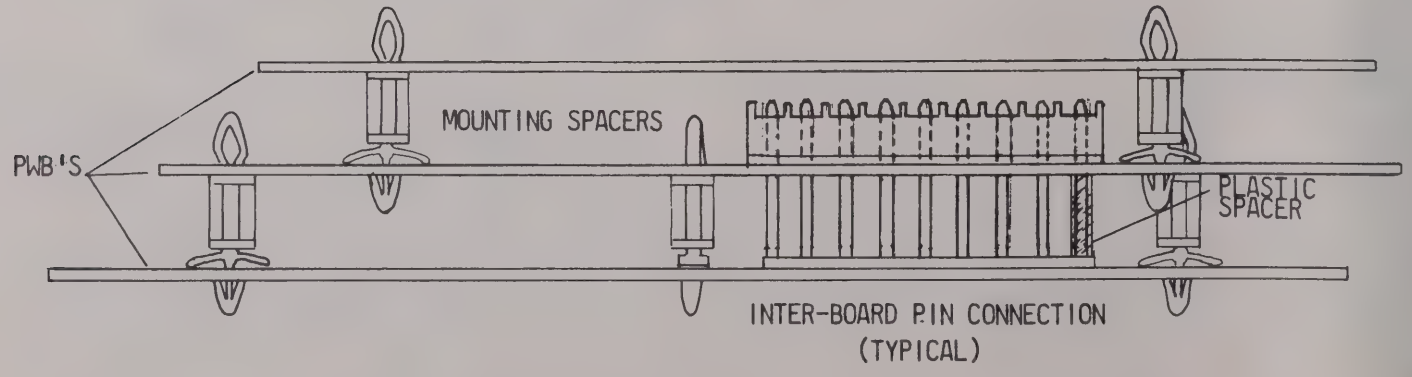
4. Carefully lift the board free from interboard pin connections.

5. When disconnecting the 440 Generator Board, note that the board is connected in the center by a row of inter-board pins. After clearing the spacers, carefully pry the pins loose, a portion at a time, until it is free of the 124-000509 Time Constant Generator Board.

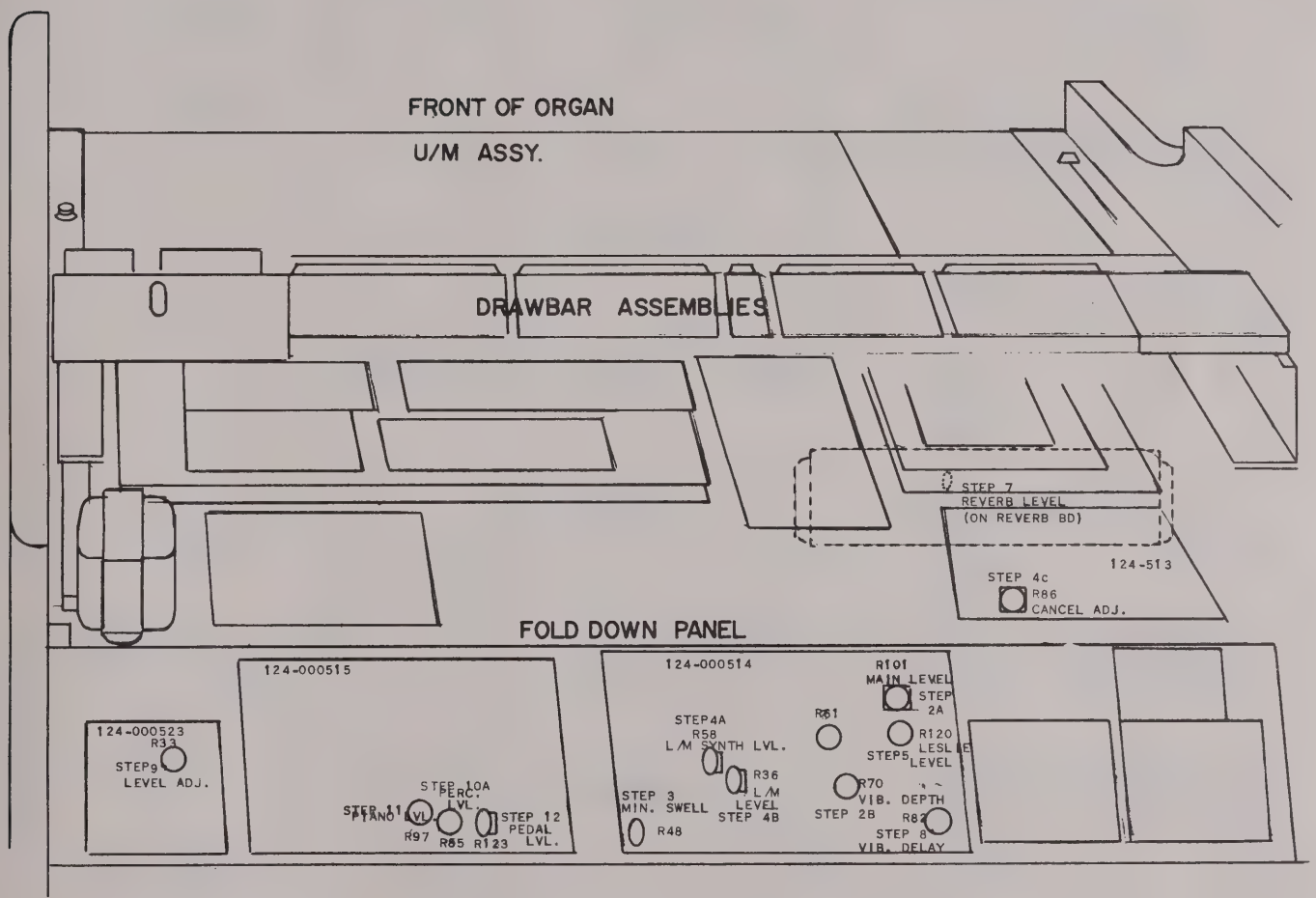
The diagrams below show a typical assembly and the hardware used for spacing and positioning of the boards.





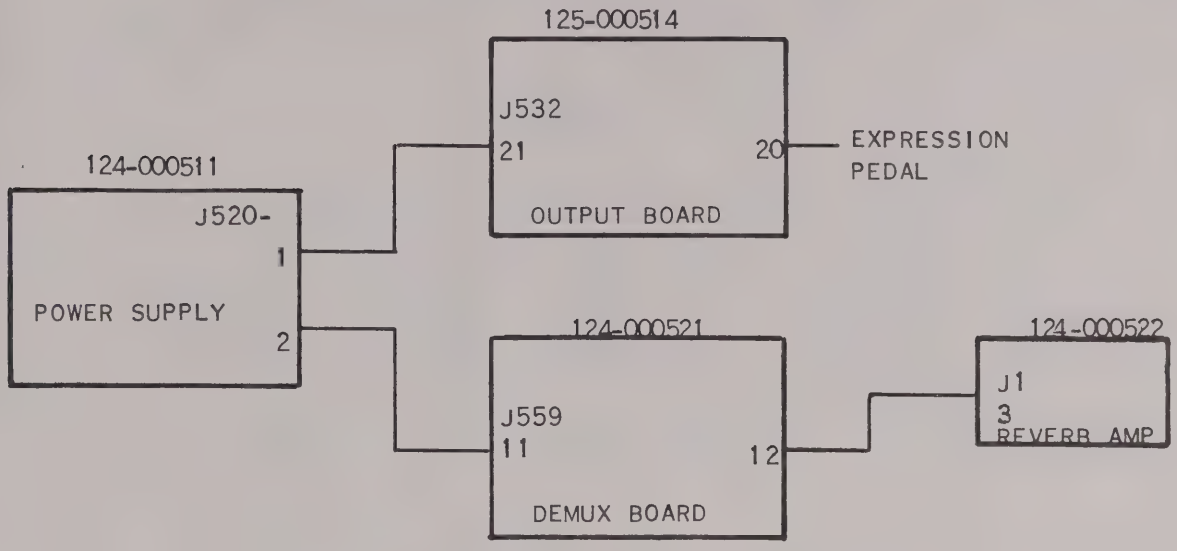


SECTION IV
TEST & ADJUSTMENT PROCEDURES

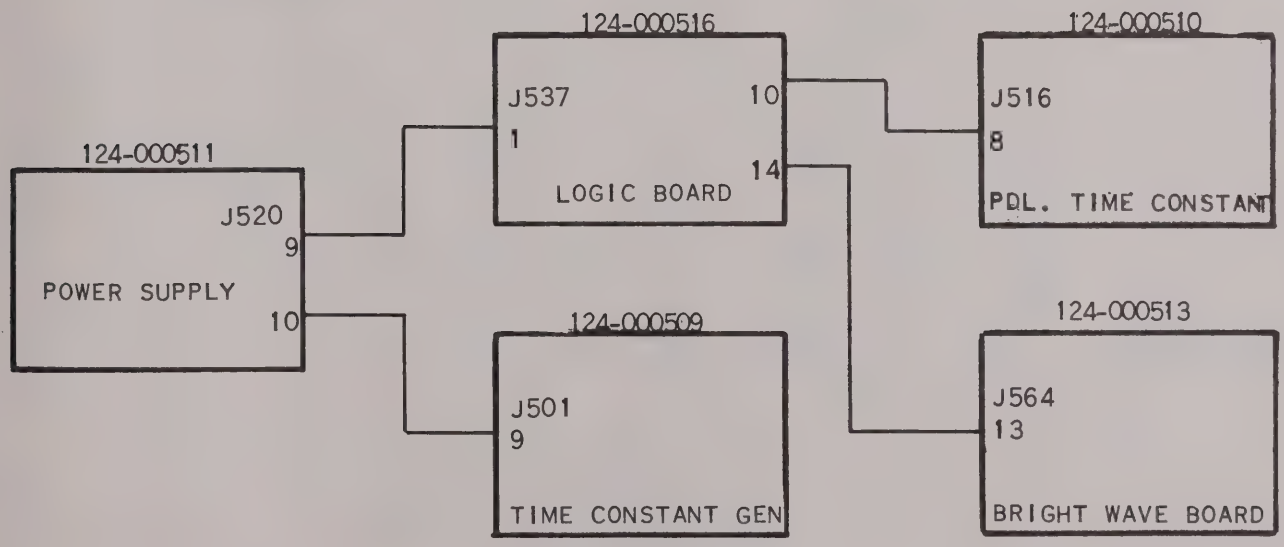


STEP	TITLE OF TEST	SETUP PROCEDURE (TABS DEPRESSED) (TONEBARS OUT)	KEY(S) DEPRESSED	TEST POINT	POT AND BOARD	SPECIFICATION AND/OR ACCEPTABLE CONDITION
1	Tuning	None		J592-5 124-514	Coil 124-508	3136 HZ
2	Main Channel Levels	a) U/M A# PR All 9 U/M A# TB's b) Vib ON	a,b) U/M 25, 29, 32	J531-4 124-514	a) Main Gain 124-514 b) Vib. Depth 124-514	a) 2.0V RMS b) 2.0V RMS
3	Minimum Swell Main	U/M A# PR All 9 U/M A# TB's	U/M 25, 29, 32	J531-4 124-514	Minimum Swell 124-514	70mV RMS
4	L/M Levels	a) L/M A# PR All 9 L/M A# TB's b-d) L/M B PR All 5 mellow (brown) drawbars	a,b) L/M 25,29,32 c) Strike L/M 44 d) Strike L/M 25,29,32	J531-4 124-514	a) L/M Syn. Level 124-514 b) L/M Bright Level 124-514 c) Cancel Adjust 124-513	a) 2.0V RMS b) 1.5V RMS c) Adjust pot for minimum thump d) Note no thump exists.
5	Leslie Channel Level	L/M A# PR All 9 L/M A# TB's Les. Lower	L/M 25, 29, 32	J531-2 124-514	Leslie Level 124-514	2.0V RMS
6	Minimum Swell Leslie	L/M A# PR All 9 L/M A# TB's	L/M 25, 29, 32	J531-2 124-514		56 - 88mV RMS
7	Reverb	a) U/M A# PR U/M A# TB Registration 000607080 Les Upper Reverb Pot at Max. b) Les on Reverb Les Upper Off	a,b) U/M 25,26,27, 28, 29	J531-4 124-514 b) J531-2	a) Reverb Level 124-522	a) 0.45V RMS b) 0.40 - 0.50V RMS
8	Vibrato Delay	L/M A# PR Any L/M A# TB Vib On Vib Delay	L/M 25	Q12 Collector 124-514	Vib Delay Adjust 124-514	800MS (to 90% Max. Oscillation)
9	Key Click Level	L/M A# PR L/M A# 16' TB		J531-4 124-514	Level Adj. 124-523	2.0V P-P NOTE: Key click envelope should be at a period of 147MS.
10	Synthesis Percussion Level	a,b) U/M B PR Second Harmonic Third Harmonic	a(U/M 25 b) U/M 25, 29, 32 & Hold	J531-4 124-514	a) Synthesis Level 124-515 b) Inhibit Delay	a) 4.0V P-P b) Adjust pot for minimum feed through after decay.
11	Piano Level	U/M B PR Grand Piano	U/M 25	J531-4 124-514	Piano Level 124-515	5.0V P-P
12	Pedal Level	Pedal 16' & 8' TB's	Pedal 13	J531-4 124-514	Pedal Level 124-515	2.0V RMS
13	Hum Level	a) None b) Les Upper Les Lower		a) 124-514 J531-4 b) J531-2 NOTE: Use Grd at J531-6 for hum Measurements.		a,b) 10mV Max. 100K HZ Low pass filter on RMS VM must be switched in.

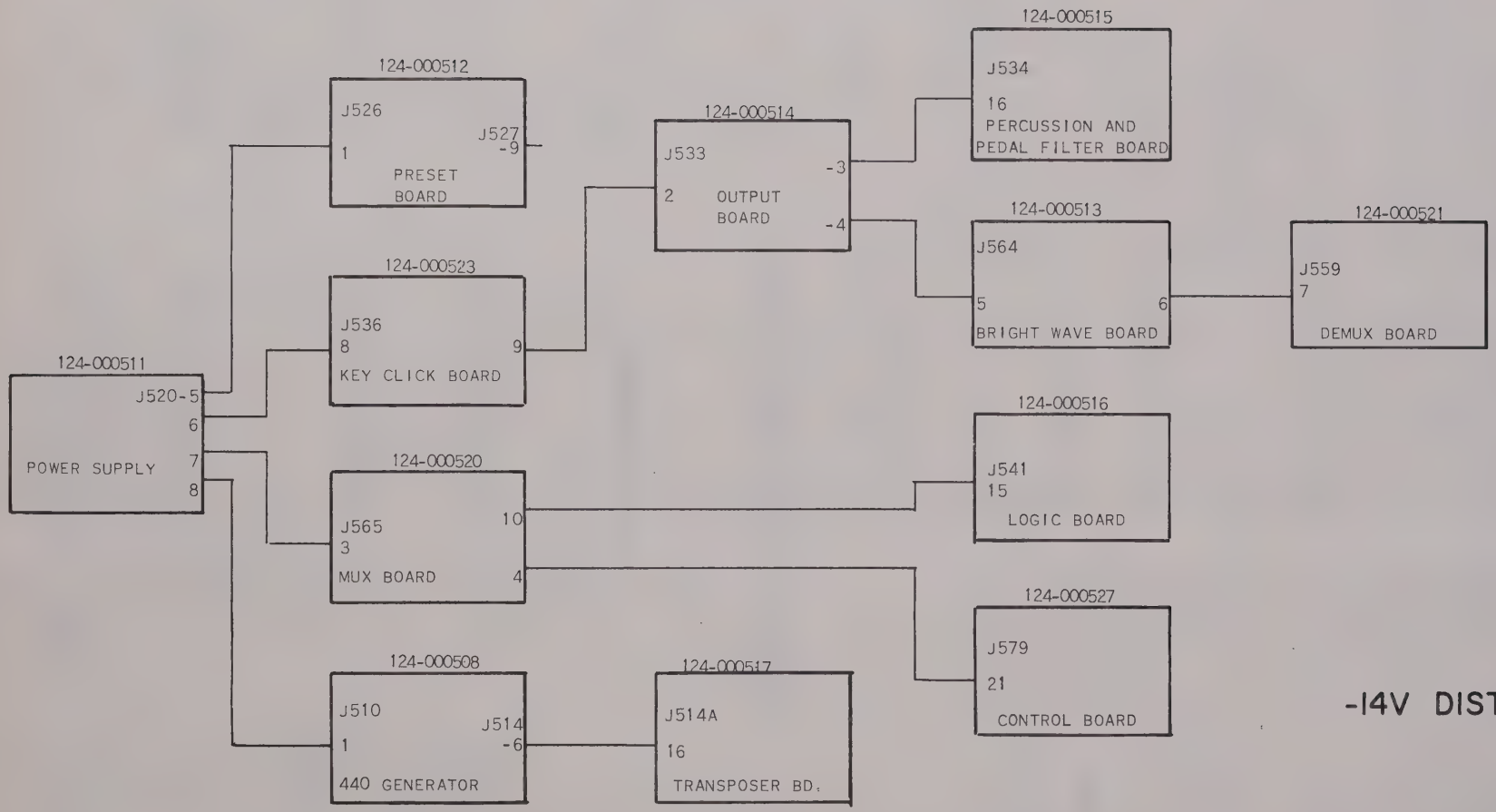
SECTION V
POWER & GROUND DISTRIBUTION



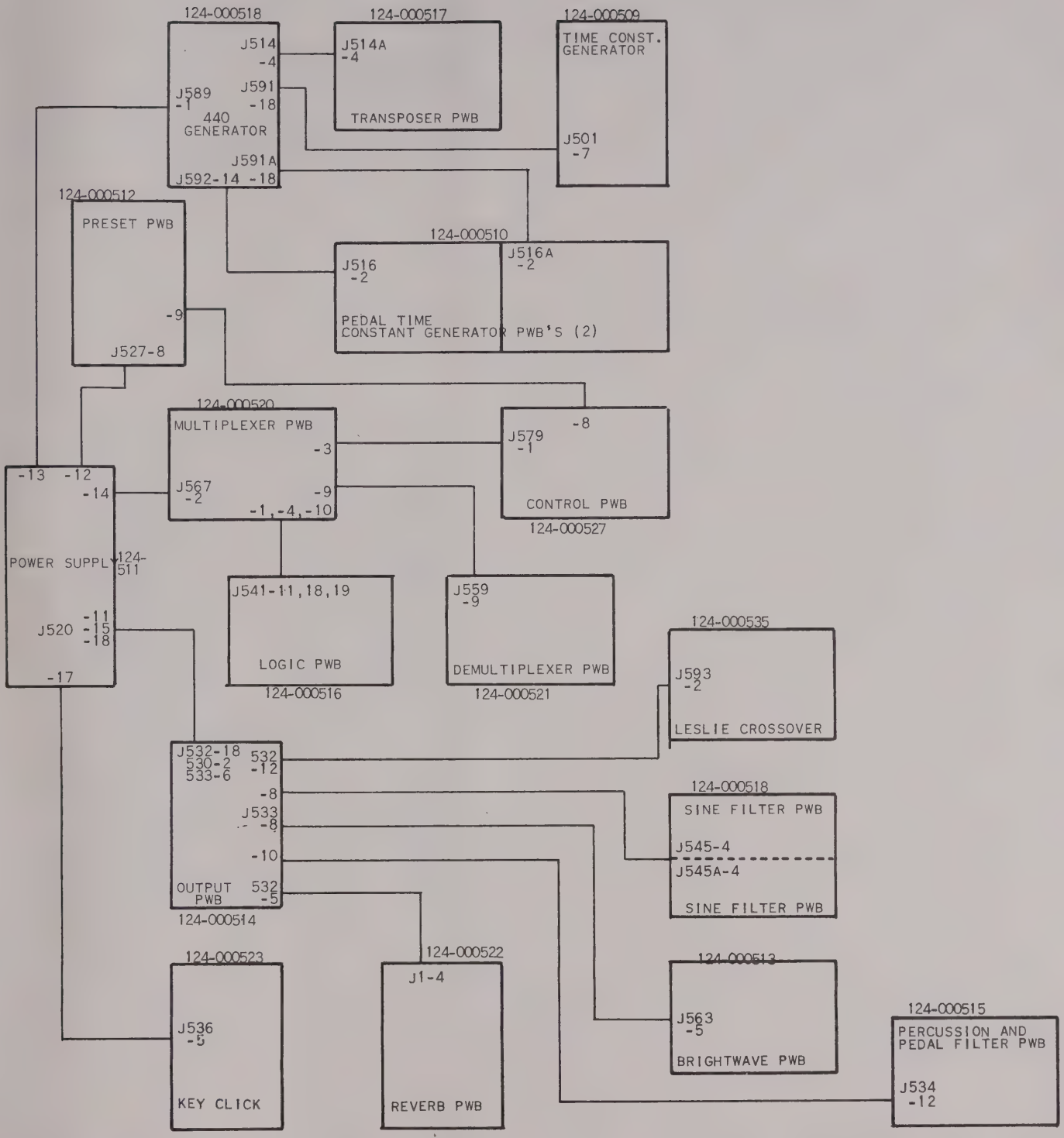
+ 24V DISTRIBUTION



-24V DISTRIBUTION



-14V DISTRIBUTION



GROUND DISTRIBUTION

S
PRINTE

SECTION VI PRINTED WIRING

FIGURE 6-1 440 Generator
FIGURE 6-2 Time Constant
FIGURE 6-3 Pedal Time Co
FIGURE 6-4 Power Supply
FIGURE 6-5 Preset PWB
FIGURE 6-6 Bright Wave P
FIGURE 6-7 Output PWB
FIGURE 6-8 Percussion &
FIGURE 6-9 Logic PWB
FIGURE 6-10 Transposer PW
FIGURE 6-11 Sine Filter P
FIGURE 6-12 Multiplex PWB
FIGURE 6-13 Demultiplex P
FIGURE 6-14 Reverb PWB
FIGURE 6-15 Key Click PWB
FIGURE 6-16 Control PWB
FIGURE 6-17 Leslie Crosso

SECTION VI
PRINTED WIRING BOARDS

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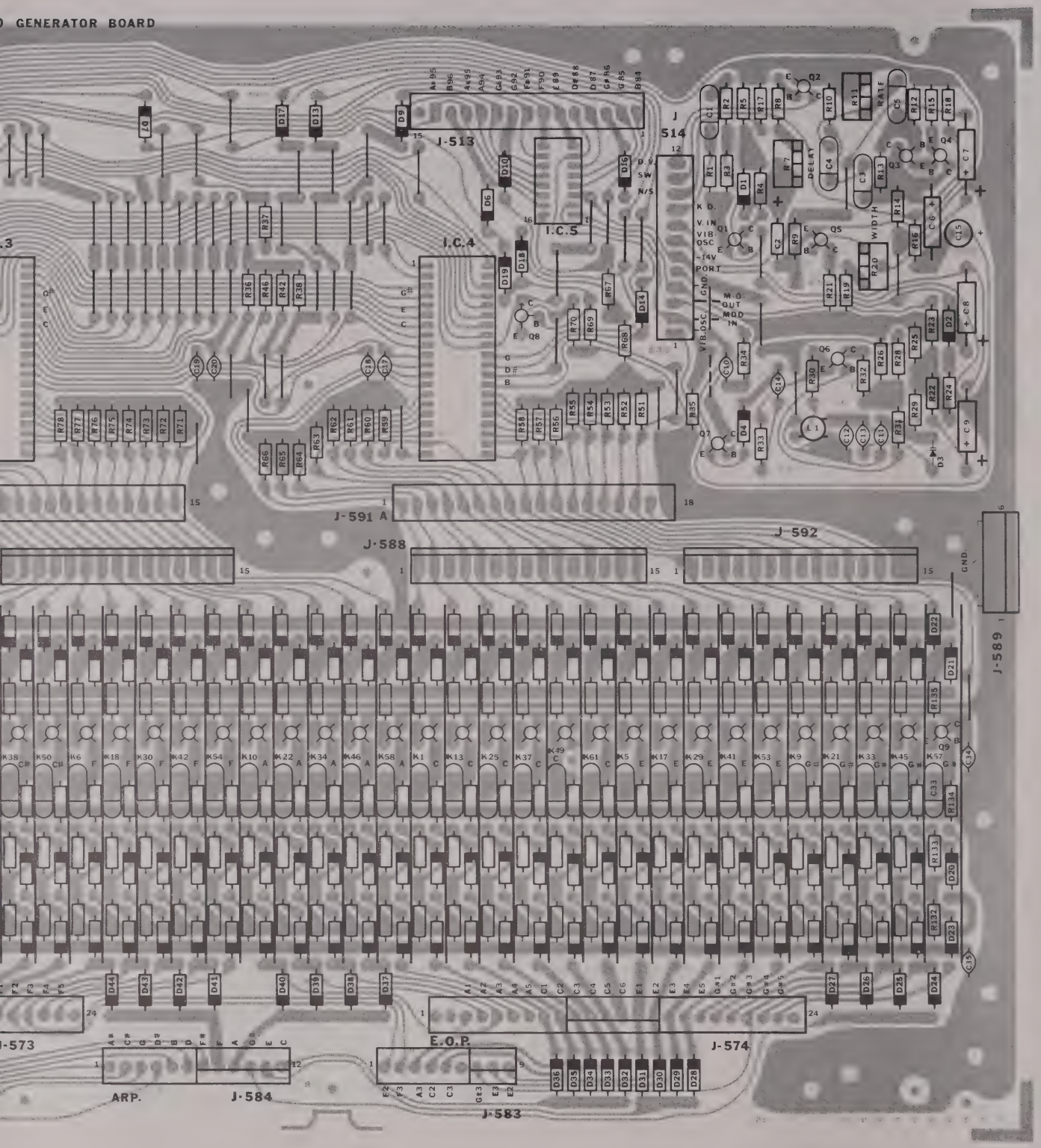
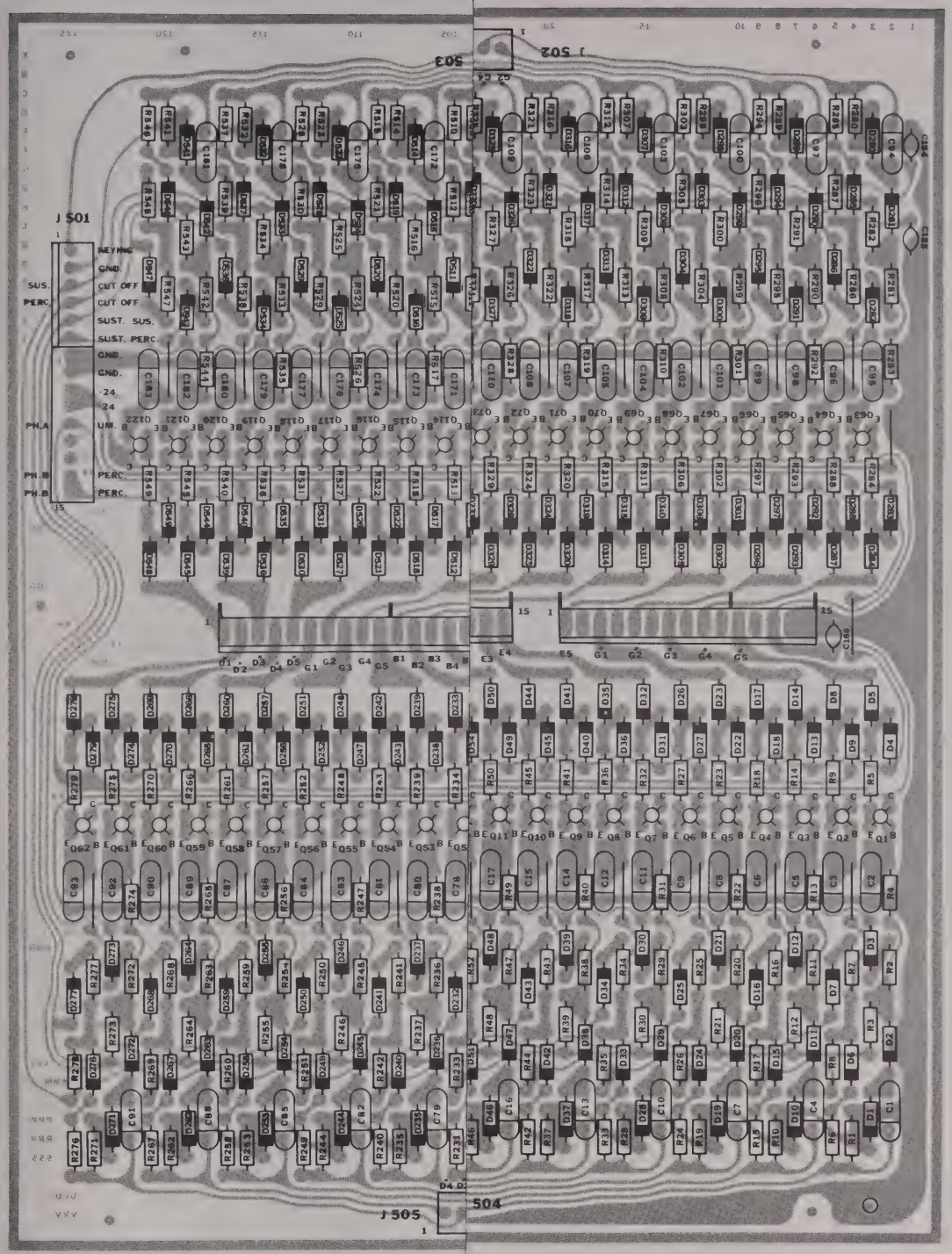
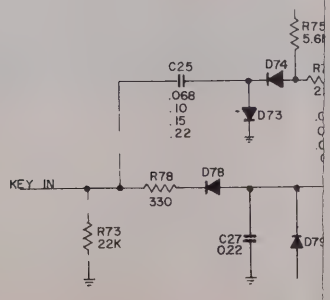
FIGURE 6-17	Leslie Crossover PWB	(124-000535)	40


GENERATOR BOARD
J-513
J 514
I.C.4
I.C.5
J-591 A
J-588
J-592
J-589
J-573
E.O.P.
J-574
ARP.
J-584
J-583
RATE
DELAY
WIDTH
K.D.
V.IN
VIB. OSC
-14V
PORT
GND.
M.O. OUT MOD IN
VIB. OSC
GND.





TIME CONSTANT G
TYPICAL KEYER COM

FIGURE 6-2
TIME CONSTANT PWB
(124-000509)

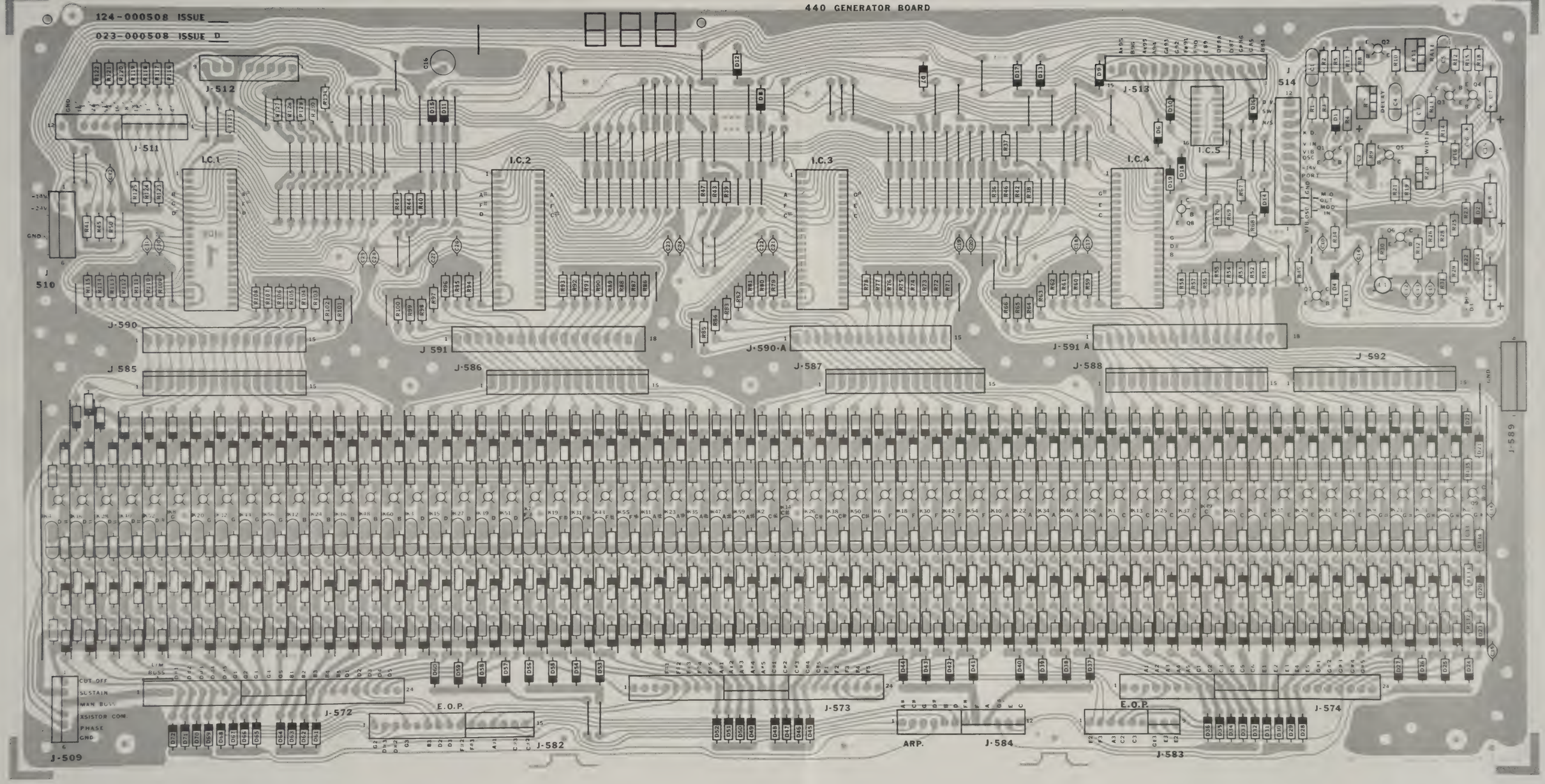
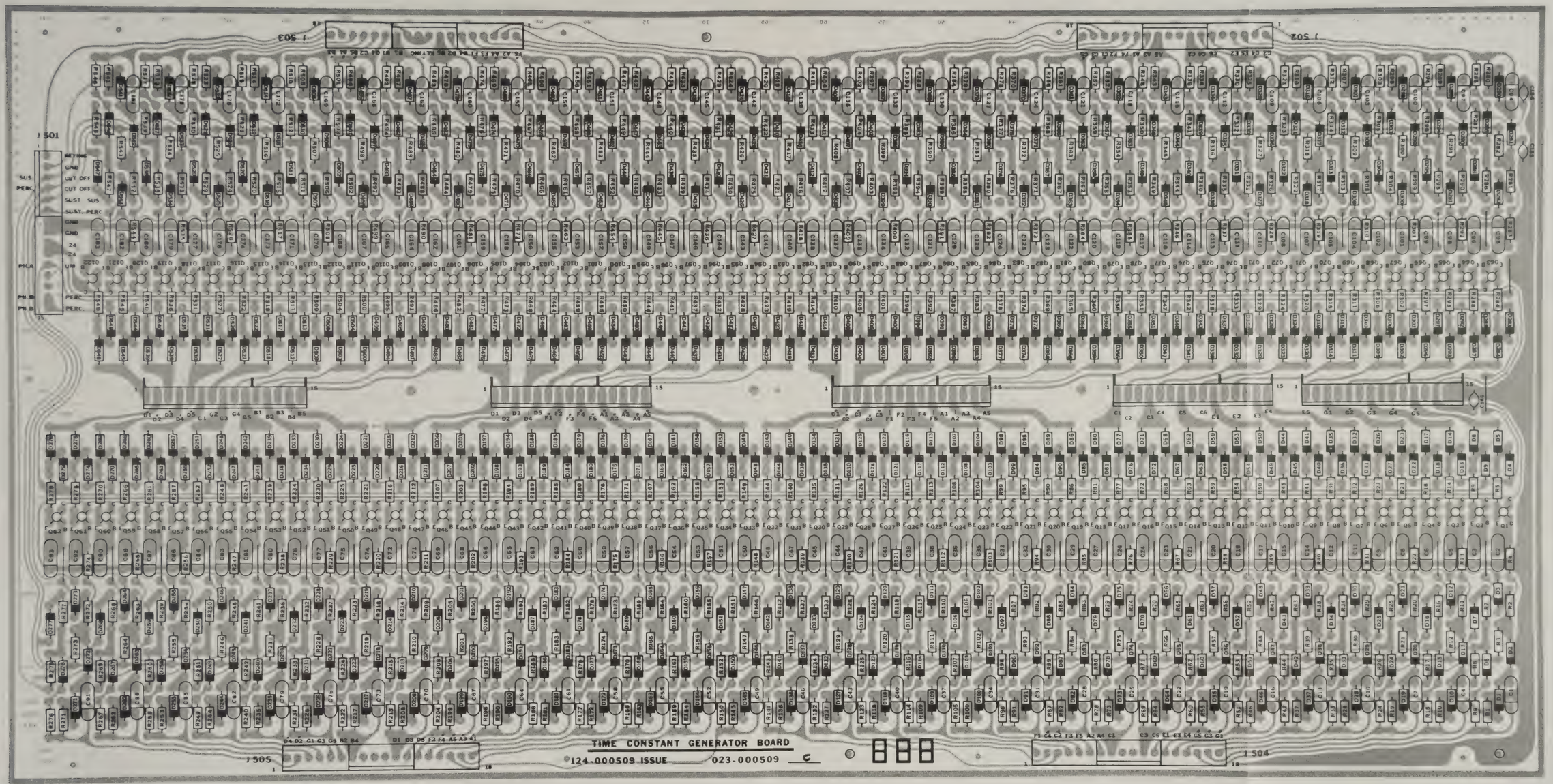
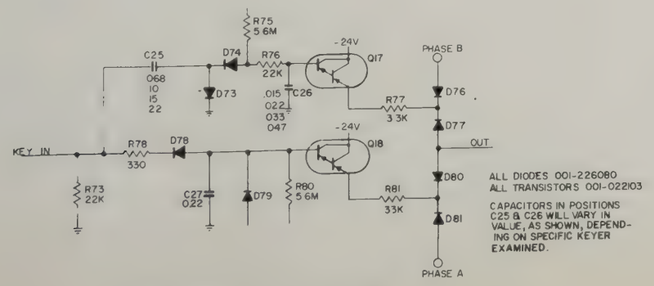


FIGURE 6-1
440 GENERATOR PWB
(124-000508)





TIME CONSTANT GENERATOR BOARD
TYPICAL KEYER COMPONENT VALUES

FIGURE 6-2
TIME CONSTANT PWB
(124-000509)

ISSUE
ISSUE 0
D24
D26
D27
D30
D29
D32
D33
D35
D36
D38
D39
Q8
Q9
Q10
Q11
Q12
Q13
C8
C9
C10
C11
C12
C13
C14
R27
R30
R33
R36
R39
D22
D25
D28
D31
D34
D37
R22
R23
R26
R29
R32
R35
R38
R37
GND.
PH.D
CUT
OFF
24V
SUS
BUS.
J510
A

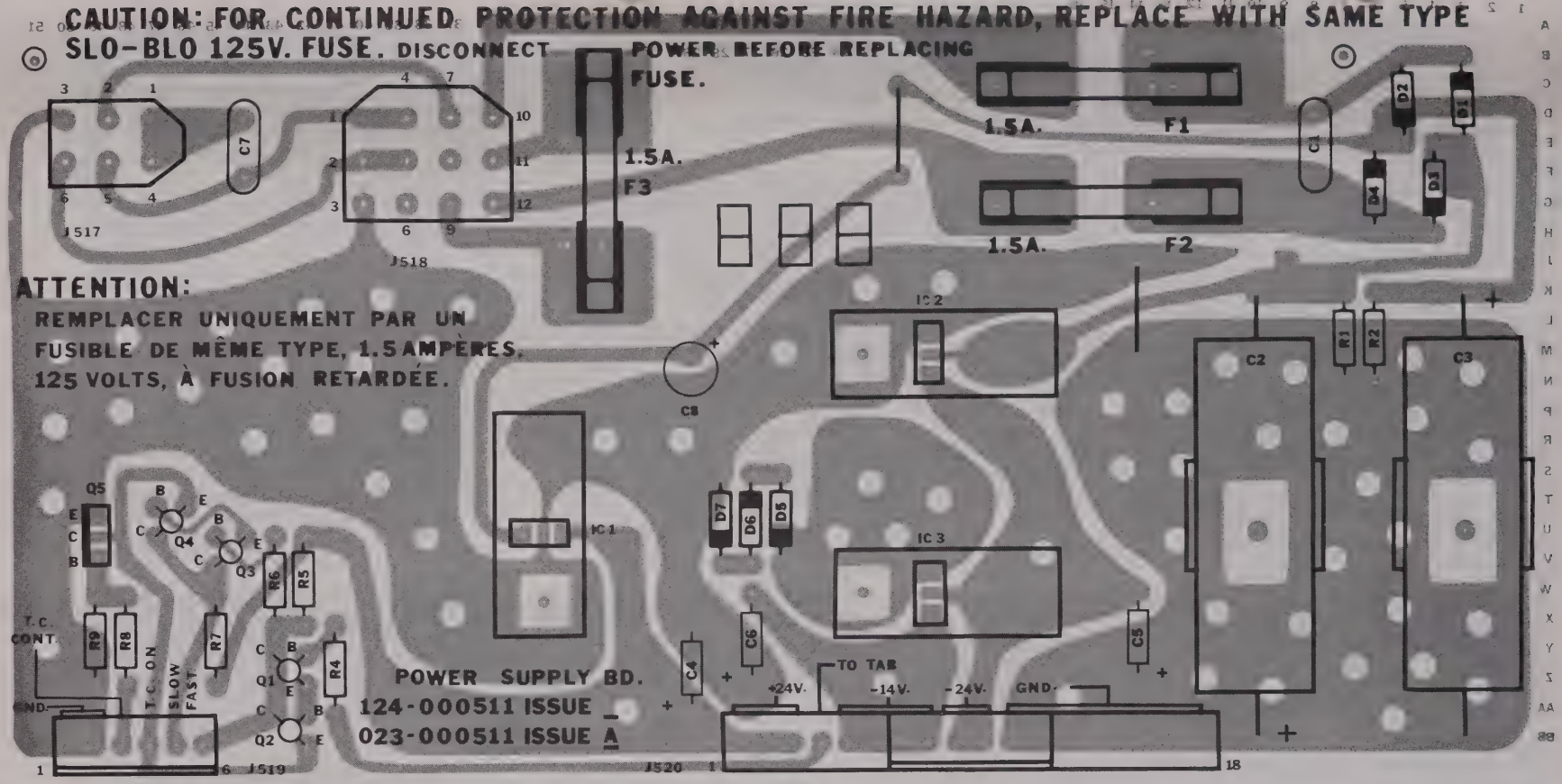


FIGURE 6-4
POWER SUPPLY PWB
(124-000511)

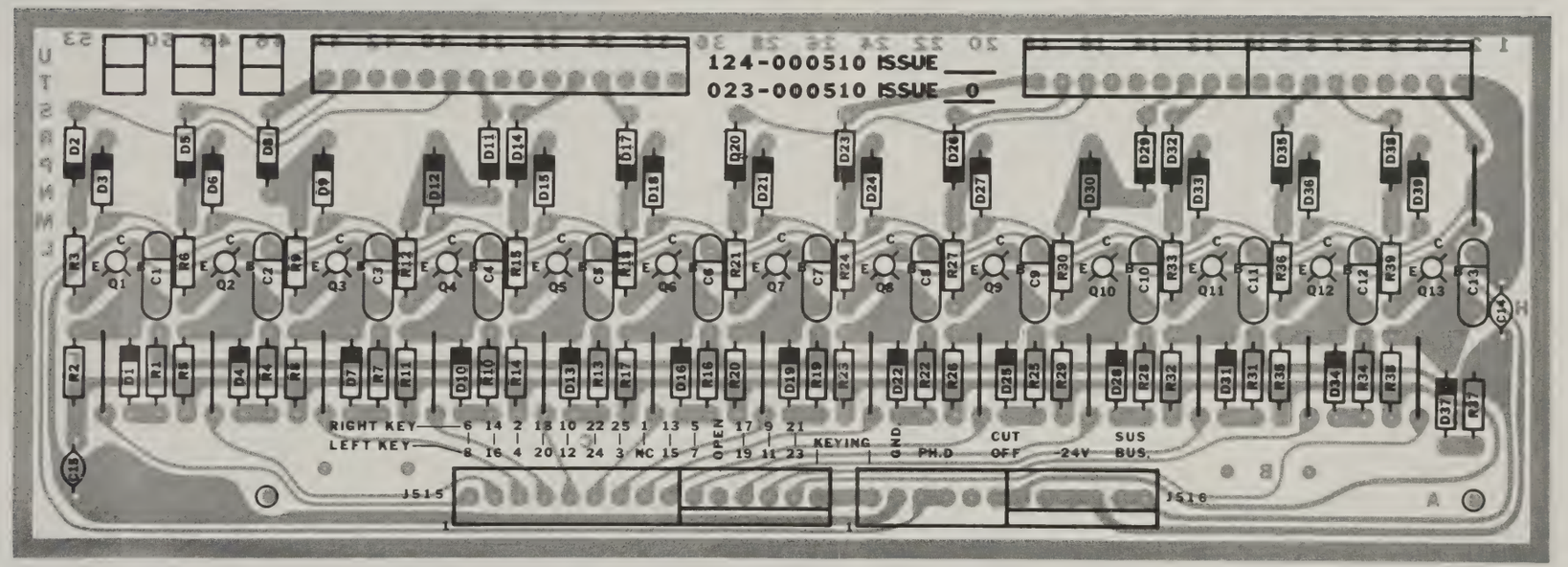


FIGURE 6-3
PEDAL TIME CONSTANT PWB
(124-000510)

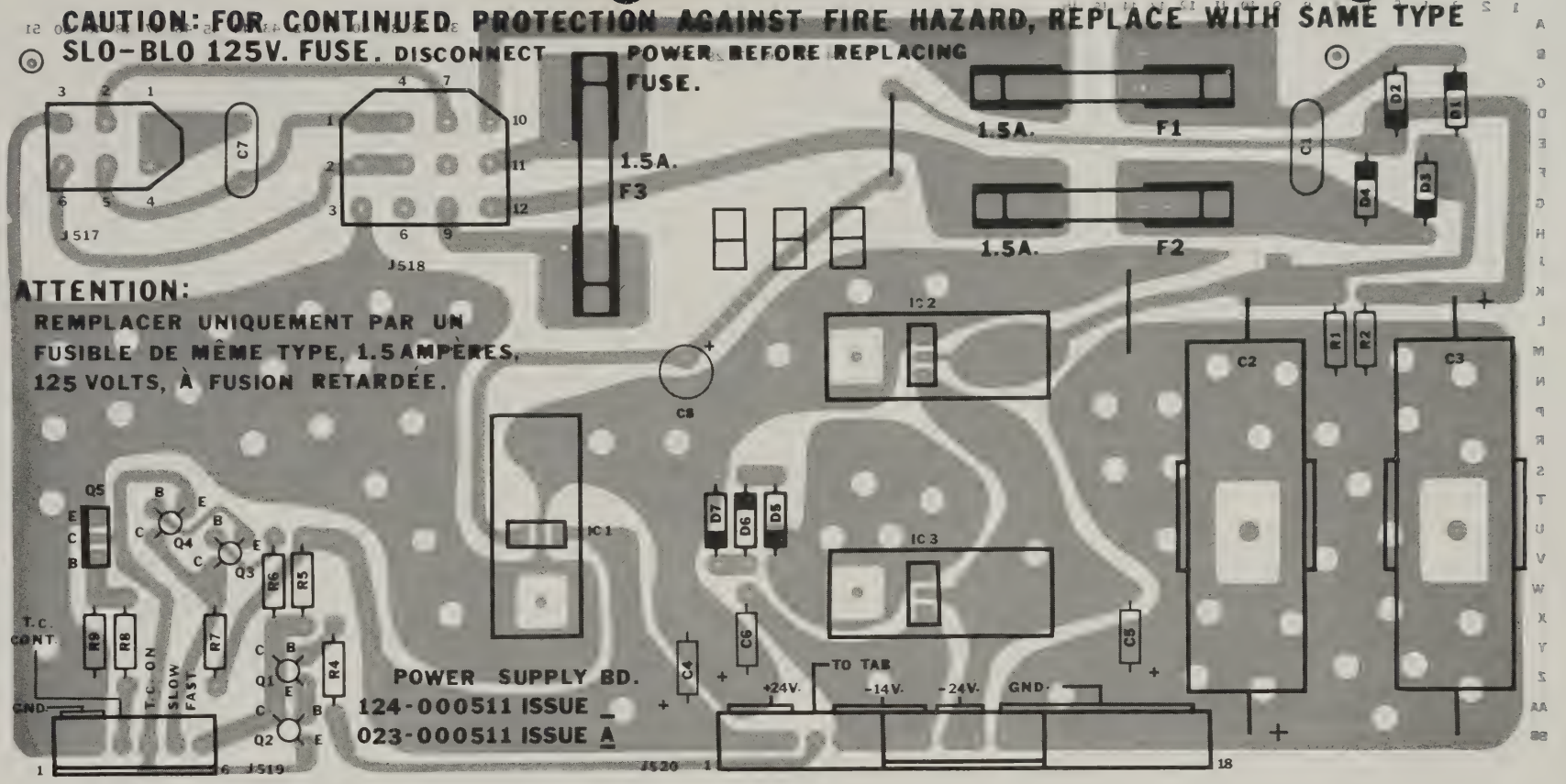


FIGURE 6-4
POWER SUPPLY PWB
(124-000511)

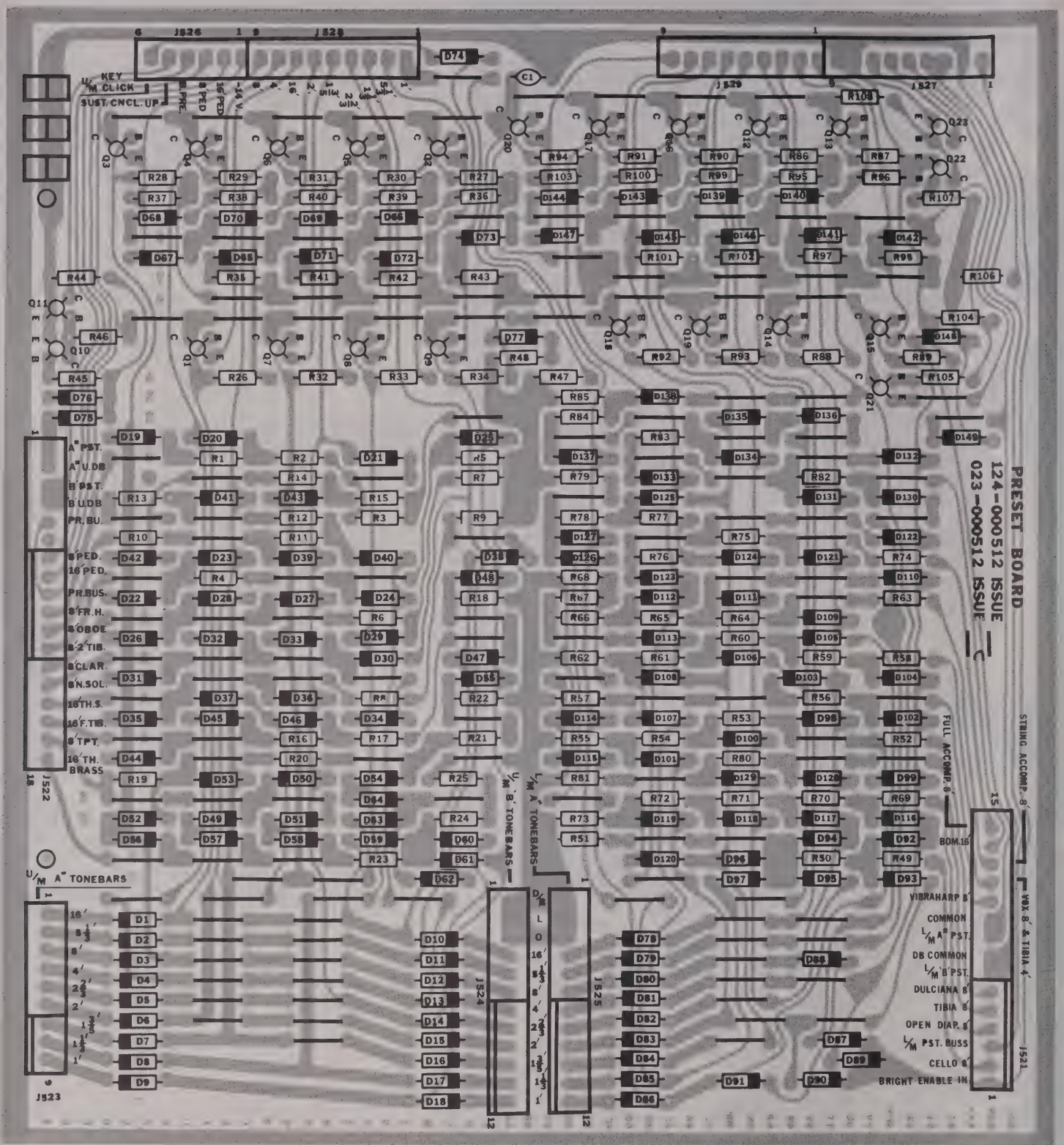


FIGURE 6-5
PRESET PWB
(124-000512)

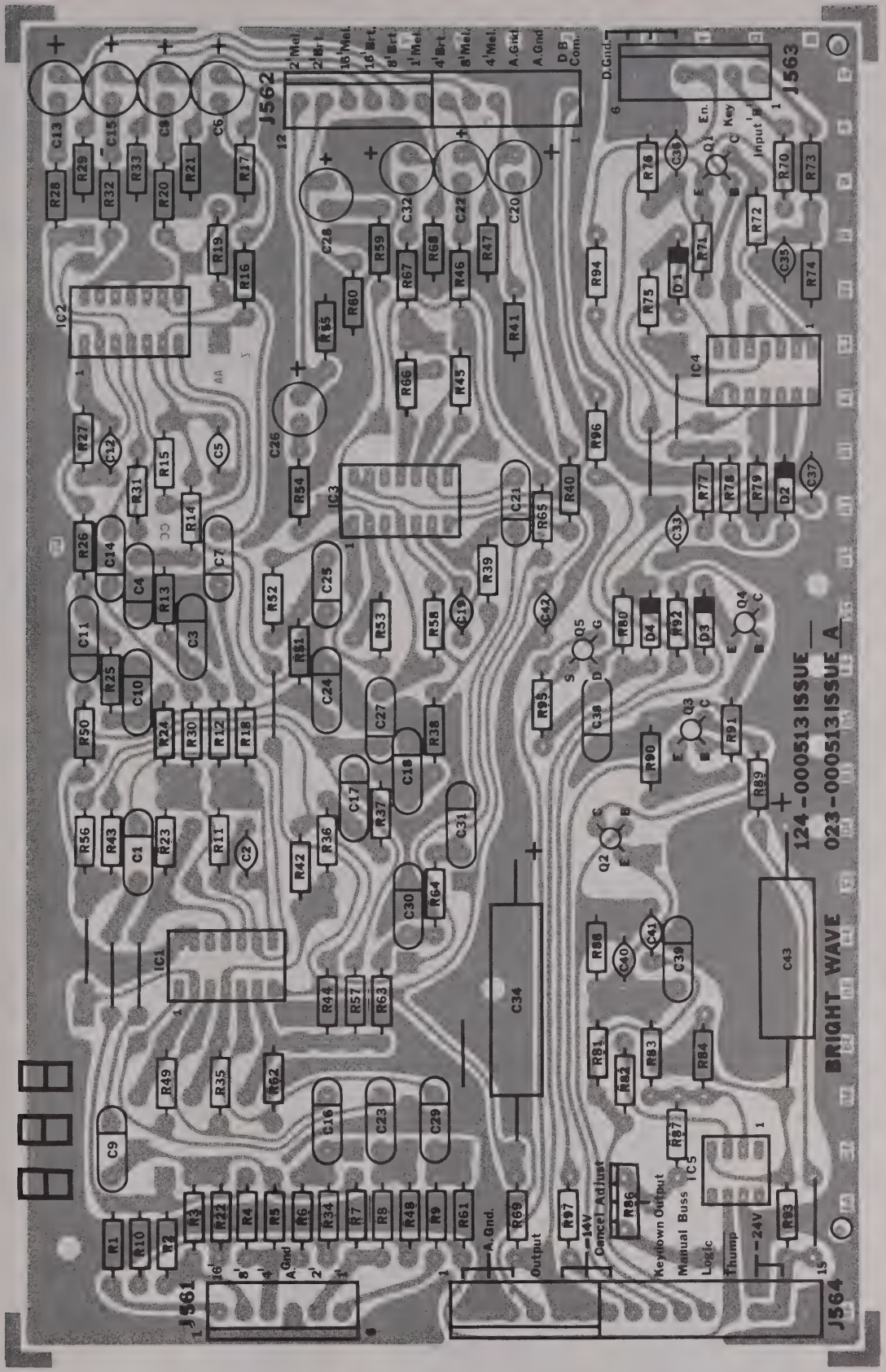


FIGURE 6-6
BRIGHT WAVE PWB
(124-000513)

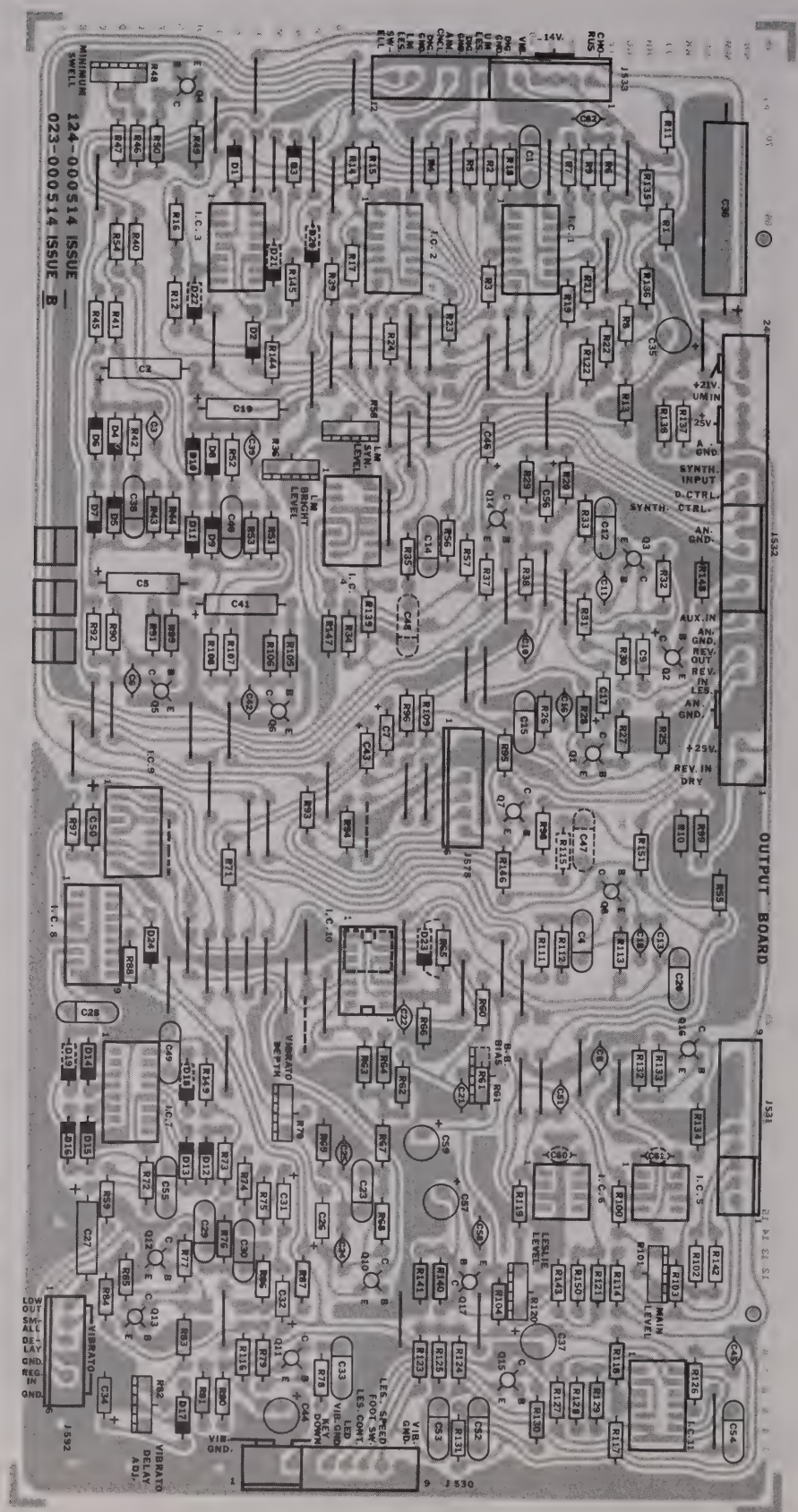


FIGURE 6-7
OUTPUT PWB
(124-000514)

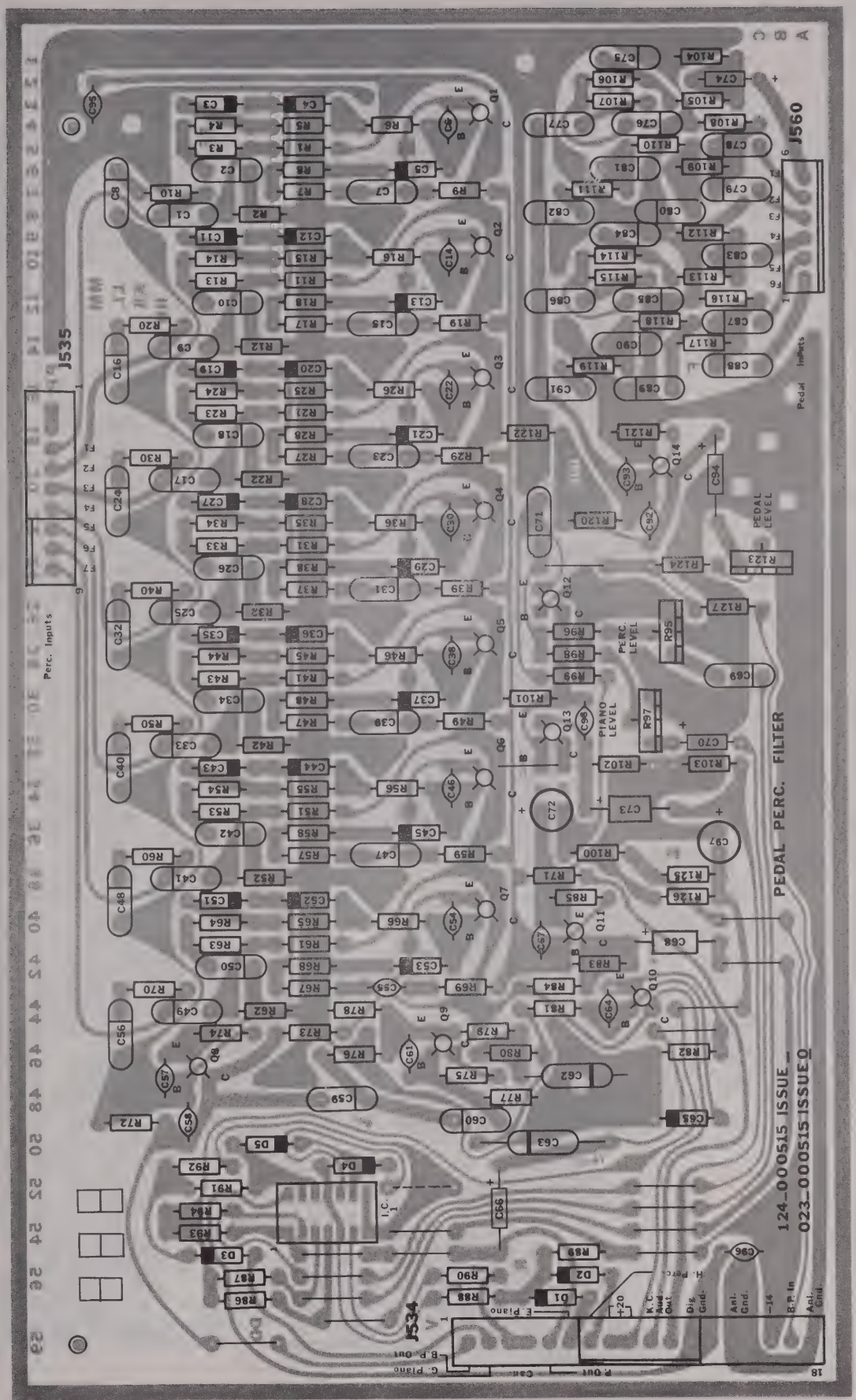


FIGURE 6-8
PERCUSSION & PEDAL FILTER PWB
(124-000515)

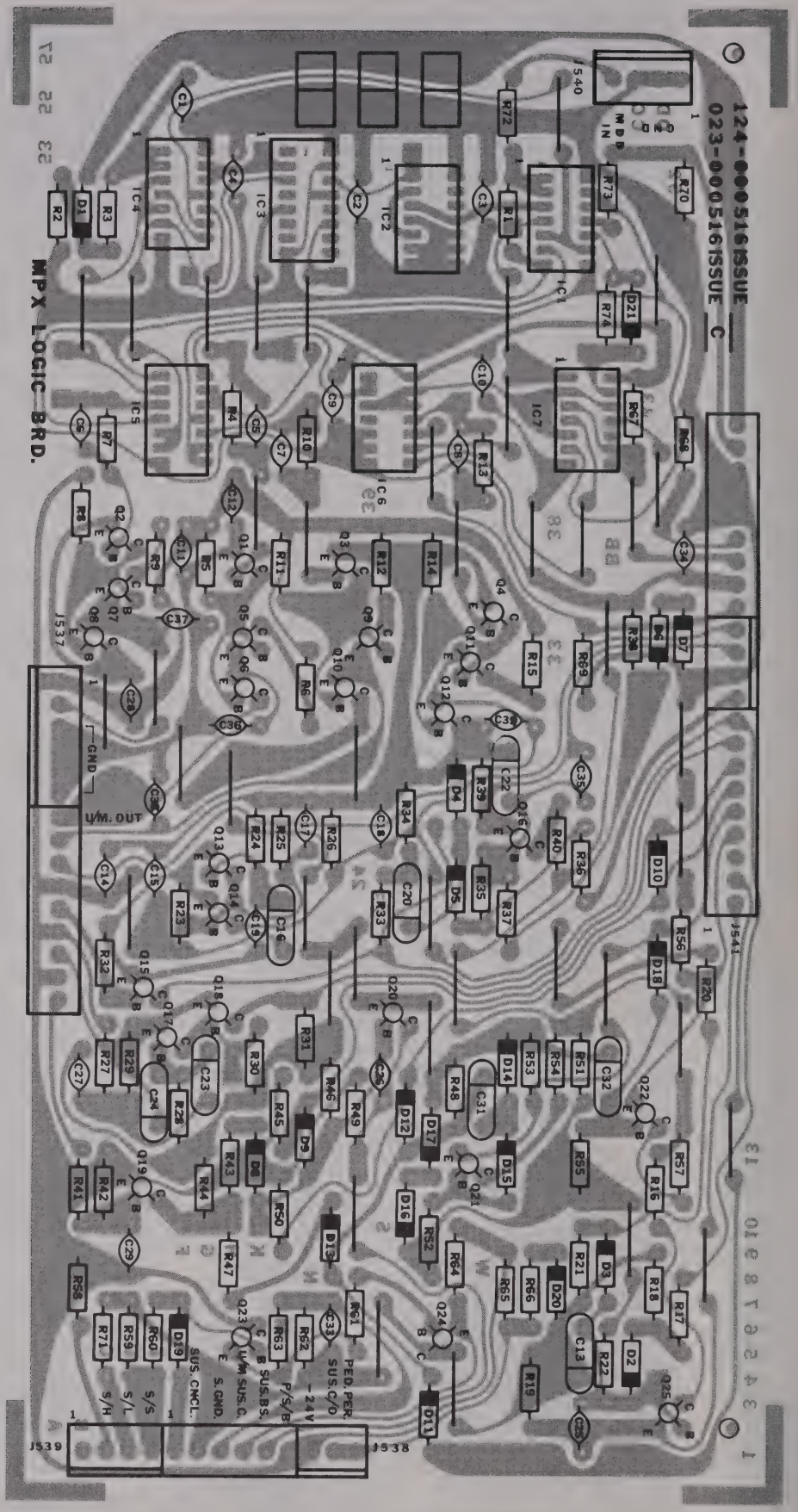


FIGURE 6-9
LOGIC PWB
(124-000516)

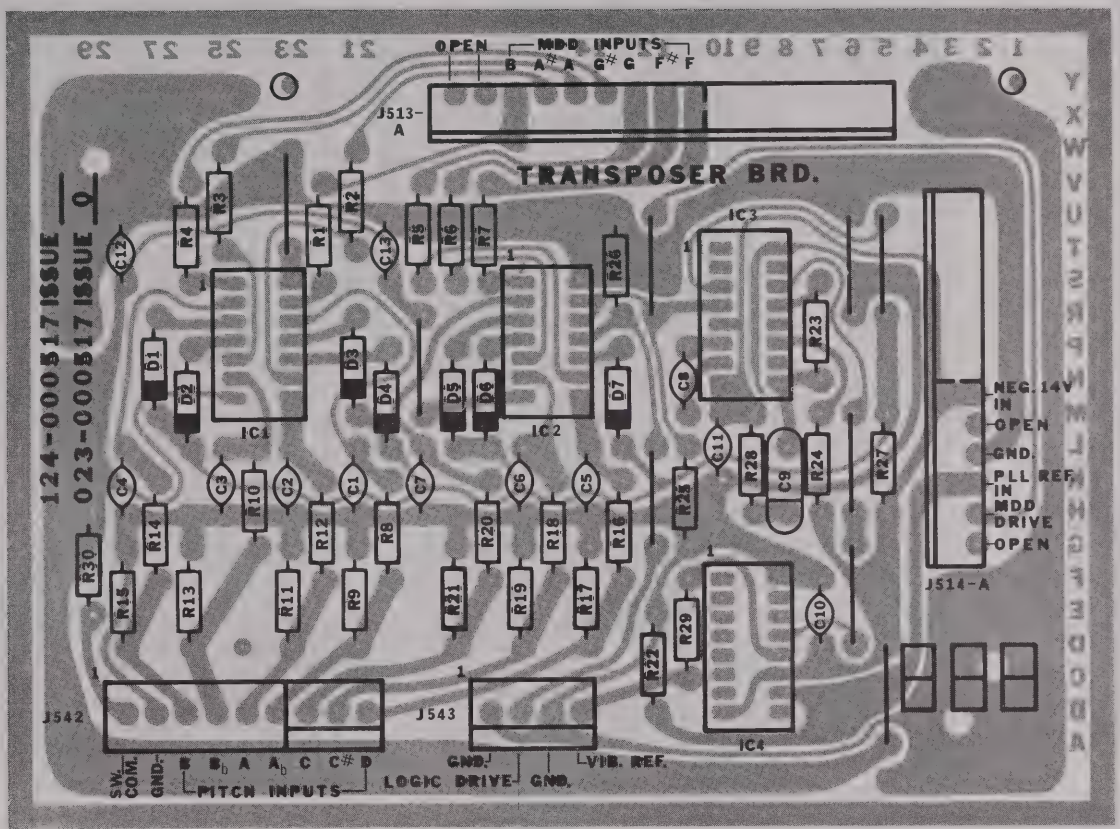


FIGURE 6-10
TRANSPOSER PWB
(124-000517)

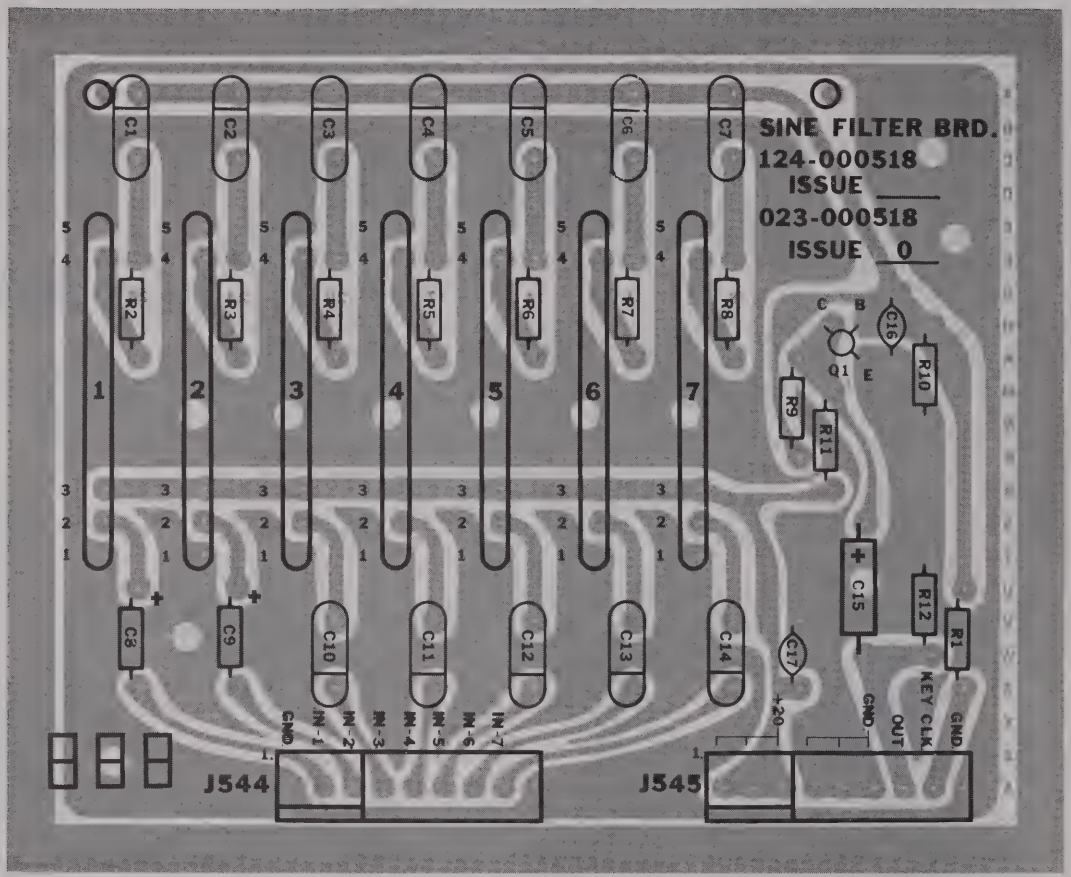


FIGURE 6-11
SINE FILTER PWB
(124-000518)

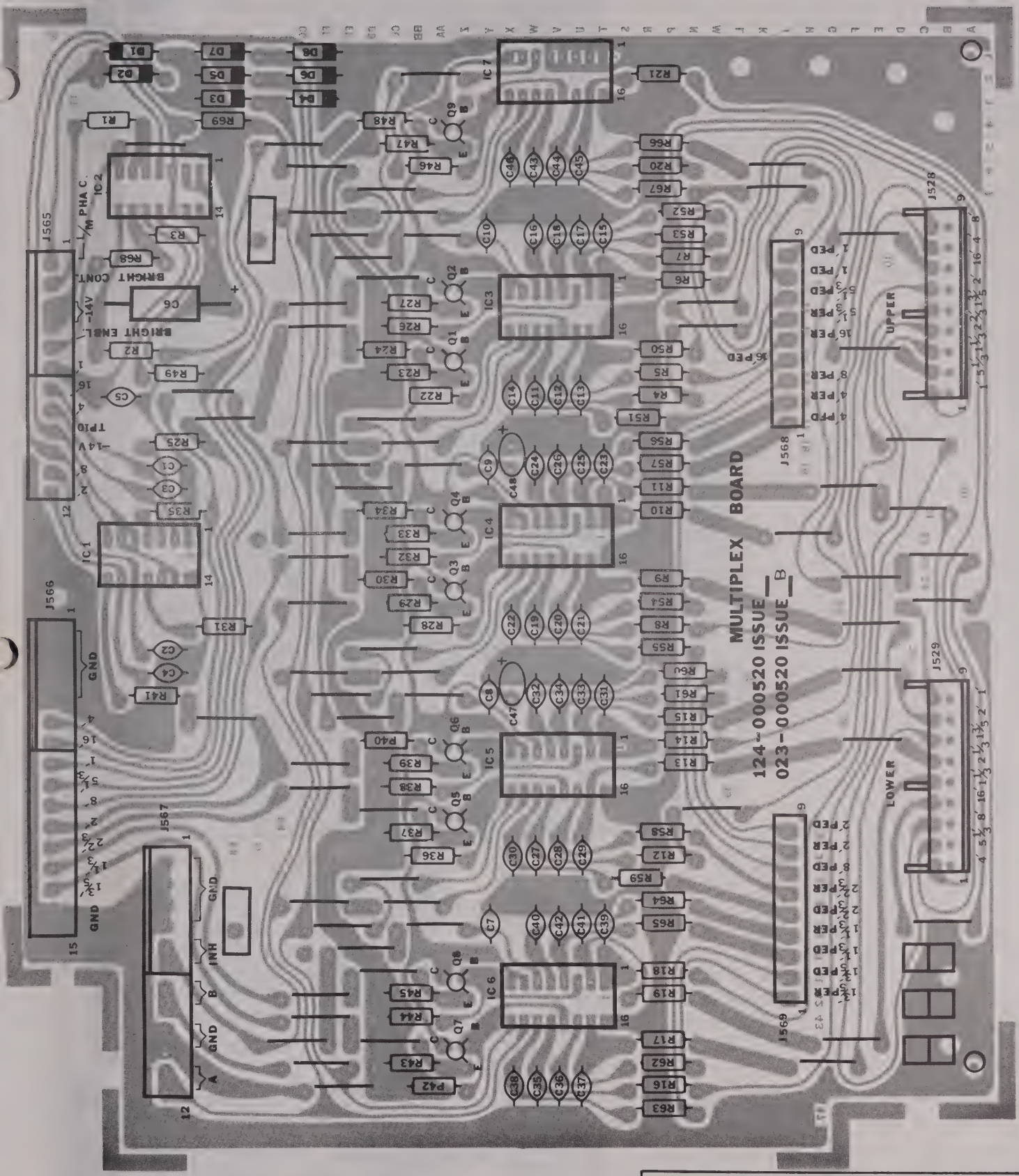


FIGURE 6-12
MULTIPLEX PWB
(124-000520)

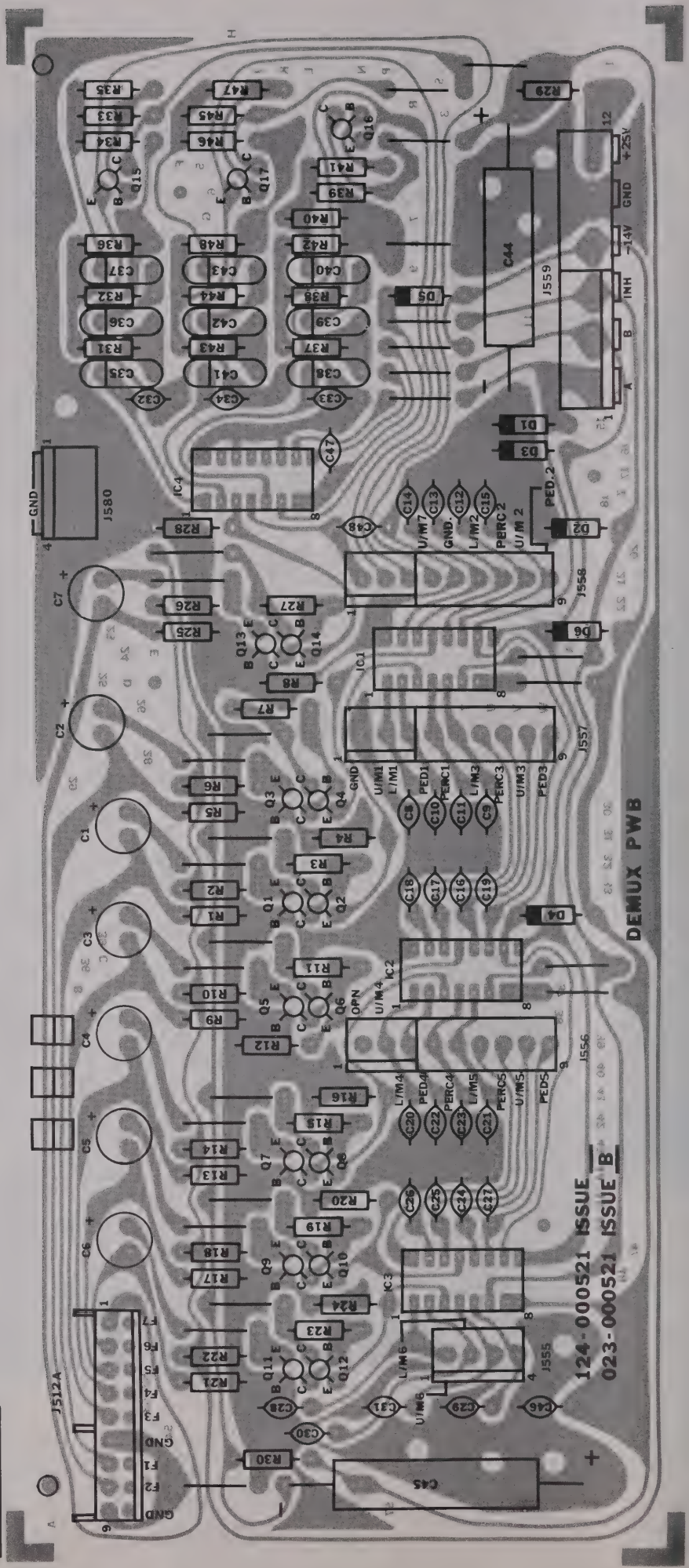


FIGURE 6-13
DEMULTIPLEX PWB
(124-000521)

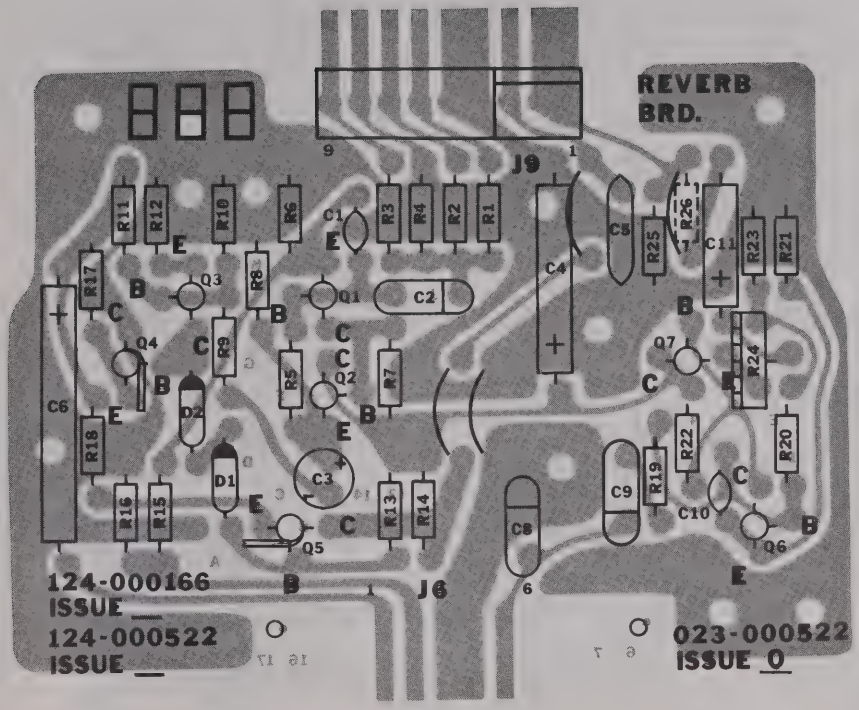


FIGURE 6-14
REVERB PWB
(124-000522)

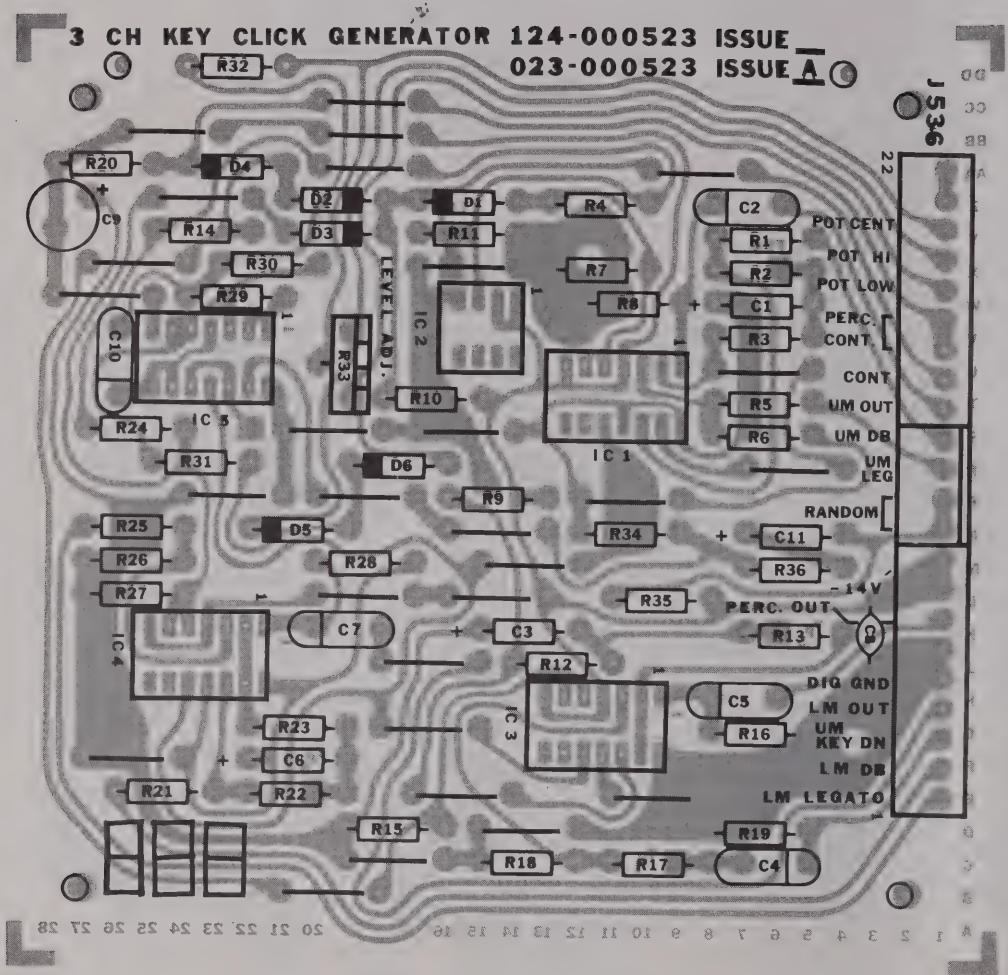


FIGURE 6-15
KEY CLICK PWB
(124-000523)

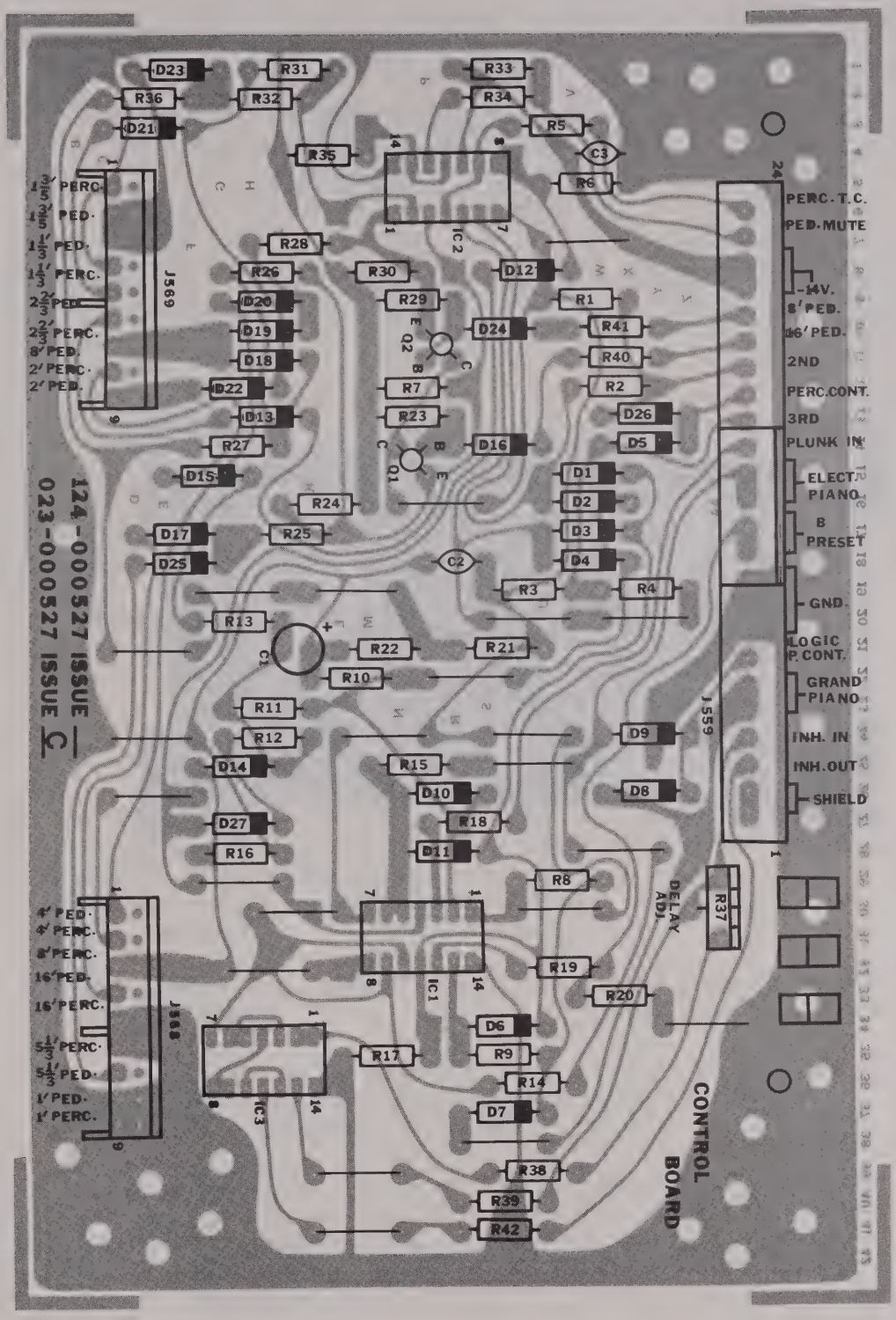


FIGURE 6-16
CONTROL PWB
(124-000527

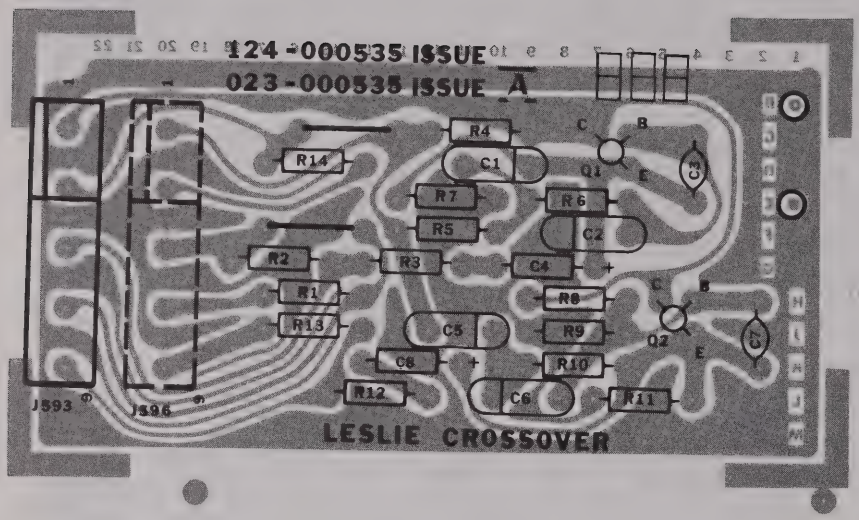


FIGURE 6-17
LESLIE CROSSOVER PWB
(124-000535)

SECTION VII
PARTS LIST

PARTS ORDERING INFORMATION

When ordering replacement parts from the Hammond Organ Company, the following guidelines should be observed:

1) Address all parts orders to:

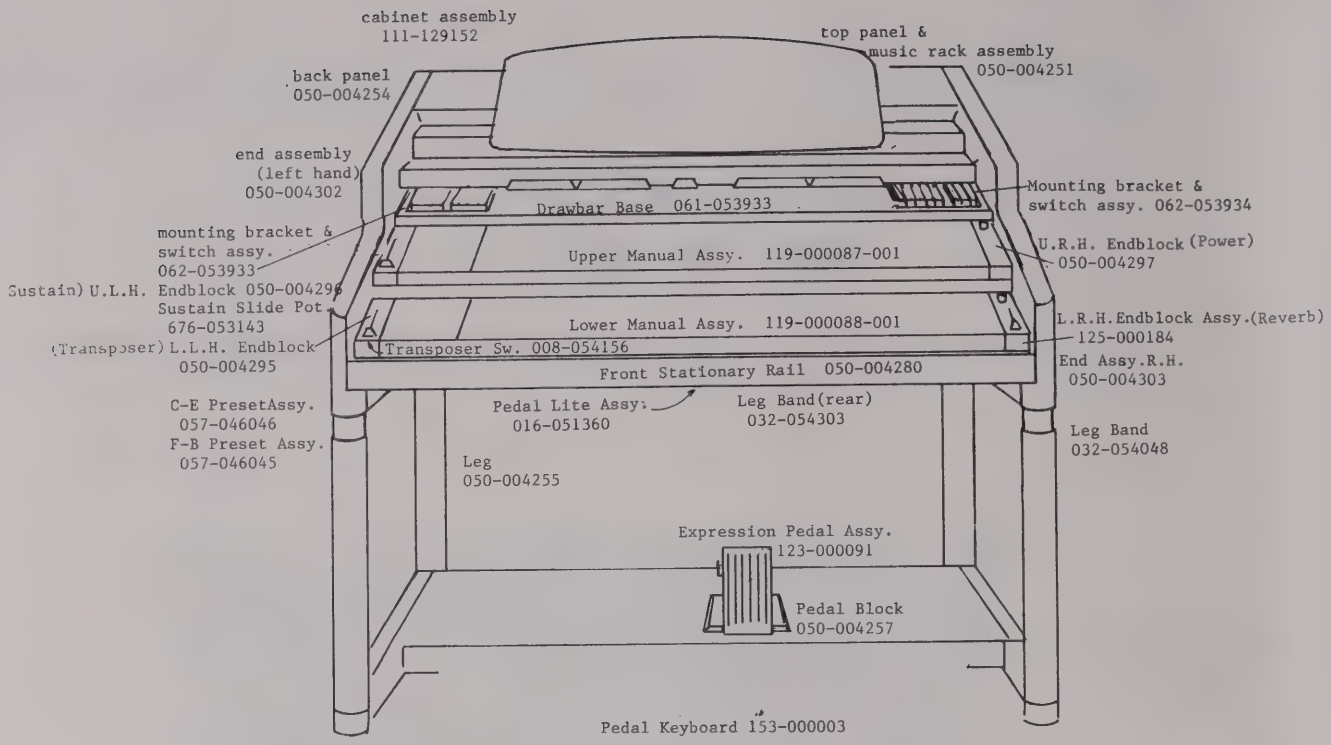
HAMMOND ORGAN COMPANY
PARTS DEPARTMENT
11700 COPENHAGEN COURT
FRANKLIN PARK, IL 60131

2) All orders should specify the model and serial numbers of the instrument that is being serviced. (Note: On late model instruments the model and serial numbers are printed on the tag attached to the underside of the organ keyboard. See Figure below.)

3) All orders should specify the Hammond part numbers of the desired parts.

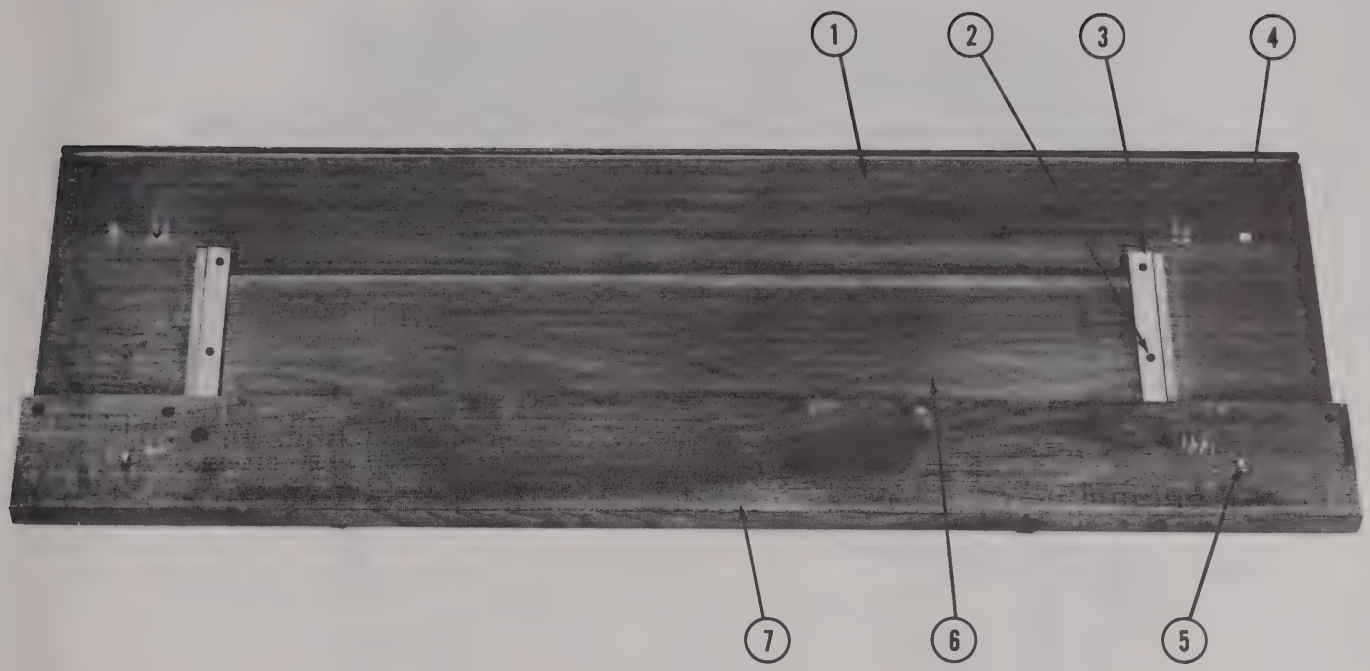
4) All orders should provide a specific description of the desired parts (for example: power transformer, 15 volt zener diode, F through B key module, etc.).

5) Standard parts such as diodes, transistors, and integrated circuits, are often available from your local parts supplier. By obtaining these parts from a local supplier, rather than from the factory, you will eliminate unnecessary waiting time.

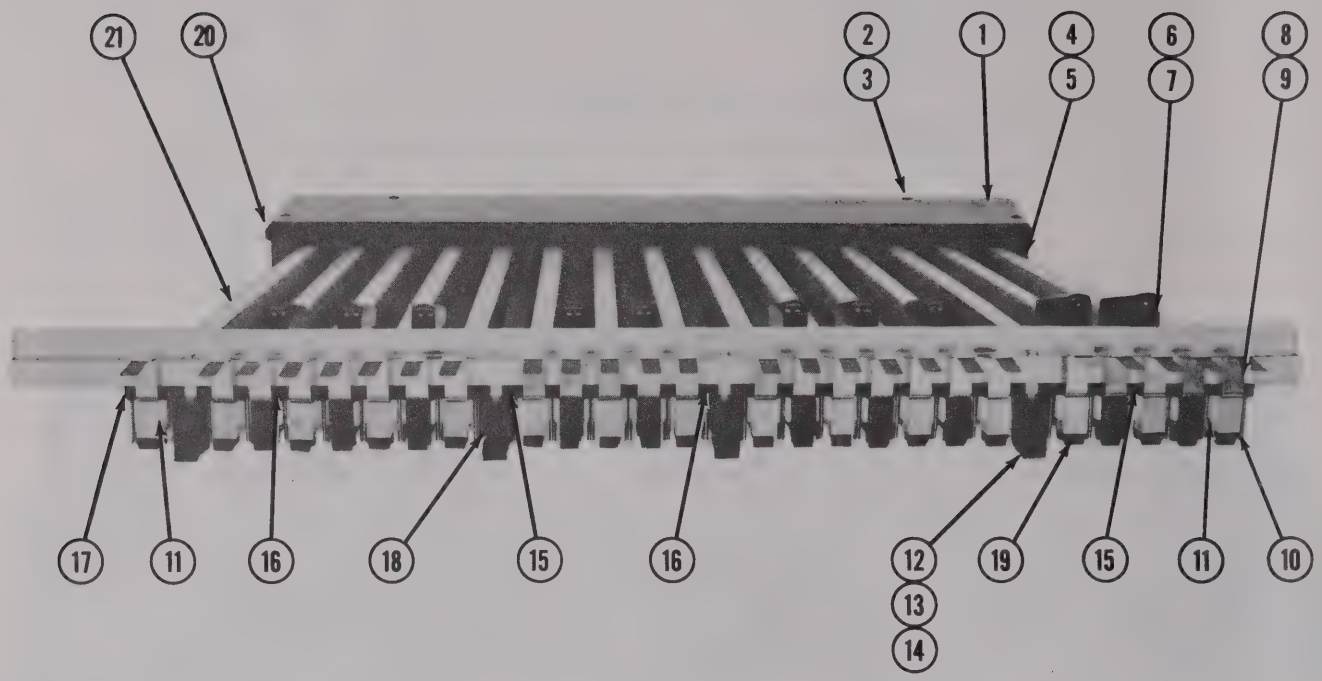


WOODWORK

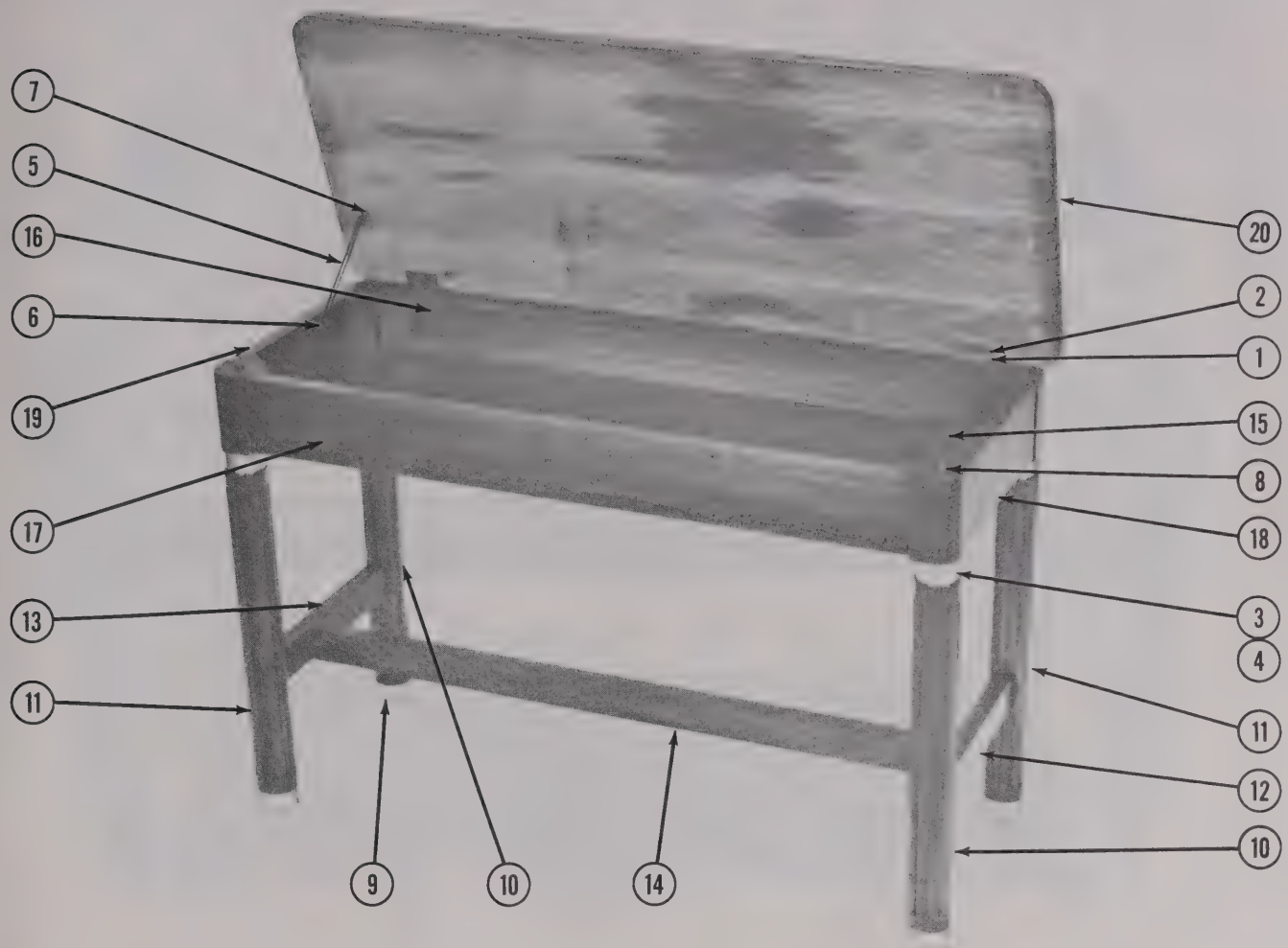
Case	050-004250
Top & Music Rack Assy.	050-004251
Top Panel	050-004284
Music Panel Assy.	050-004252
Back Panel	050-004254-001
Screw (Long 4ea)	879-072333
Screw (Short 2ea)	879-071533
Washers (6ea)	999-000413
Hammond Logo on Back Panel	037-054306
Full End Assy. L/H	050-004258
Full End Assy. R/H	050-004259
Bottom Shelf & Rail Assy.	050-004275
Front Stationary Rail Assy.	050-004280
Top Rail	050-004282
Leg Front L/H	050-004255-001
Leg Rear L/H	050-004255-002
Leg Front R.H.	050-004255-003
Leg Rear R/H.	050-004255-004
Leg Stretcher Right Side	050-004271
Leg Stretcher Left Side	050-004270
Leg cap for Both rear Legs	026-054053
Bottom Shelf Assy.	050-004276
Swing Panel	050-004299
Strike for Optional Top Lock	032-030627
Screws for Strike	879-020737
Opitonal Top	130-910020
Lock	032-030626
Key	032-030629



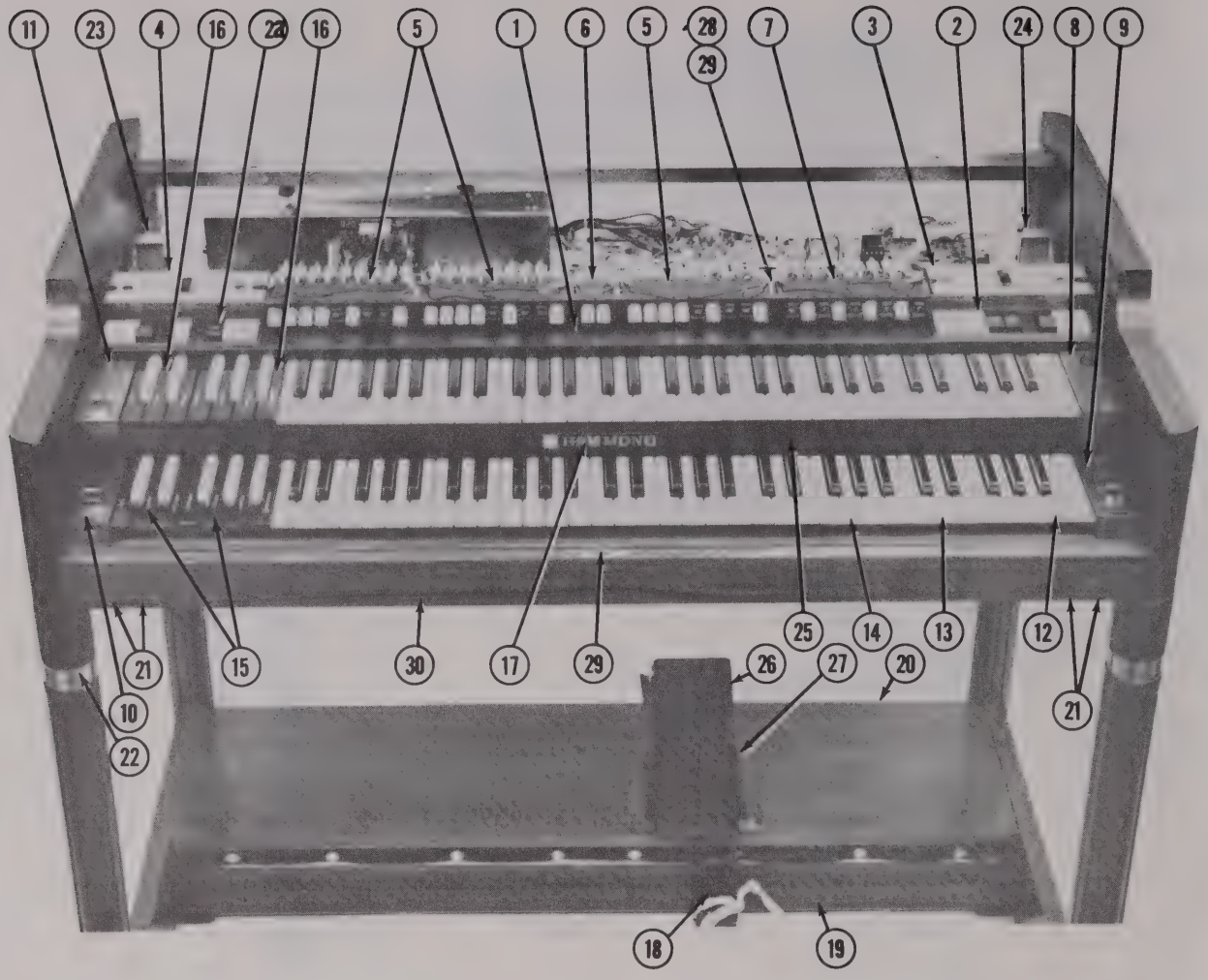
	TOP PANEL & MUSIC RACK ASSY.		050-004257
1	Top Panel		050-004284
2	Screw	(4ea)	999-047801
3	Guide	(2ea)	033-054313
4	Insert		999-016971
5	Screw	(2ea)	801-071138
6	Music Panel		050-004252
	Pin	(2 Used)	007-039112
7	Music Rack		050-004285
	Filler Block L.H.		050-004286
	Filler Block R.H.		050-004287



ITEM #	PEDAL CLAVIER	153-000003
	C# #1 Octave	060-035596
	D# #1 Octave	060-035595
	F# #1 Octave	060-035594
	G# #1 Octave	060-035593
	A# #1 Octave	060-035592
	C# #2 Octave	060-035590
	D# #2 Octave	060-035589
	F# #2 Octave	060-035590
	G# #2 Octave	060-035591
	A# #2 octave	060-035592
	NATURALS ALL	060-035564
1	Top Cover	070-000308-001
2	Screw (4 used)	883-000001
3	Washer (4 used)	999-000413
4	Flat Spring (25 used)	012-035585
5	Screw (25 used)	885-091534
6	Cap Black (10ea)	025-001698
7	Screw (2 per cap)	822-102512
8	Pedal Pusher (25ea)	012-001800
9	Screws	879-071114
10	Roll Pin (30ea)	020-039810
11	Slide Guide Felt (50ea)	042-001721
12	Screw	801-091514
13	Pedal Guid Bushing	017-034726
14	Felt foot	042-001727
15	Upstop felt	042-001911
16	Upstop felt	042-001912
17	upstop felt	042-001914
18	Stretcher (3ea)	070-000501
19	Down stop felt (25ea)	042-001720
20	Molded Bumper (2ea)	025-034727
21	Natural pedals and sharps	060-035564



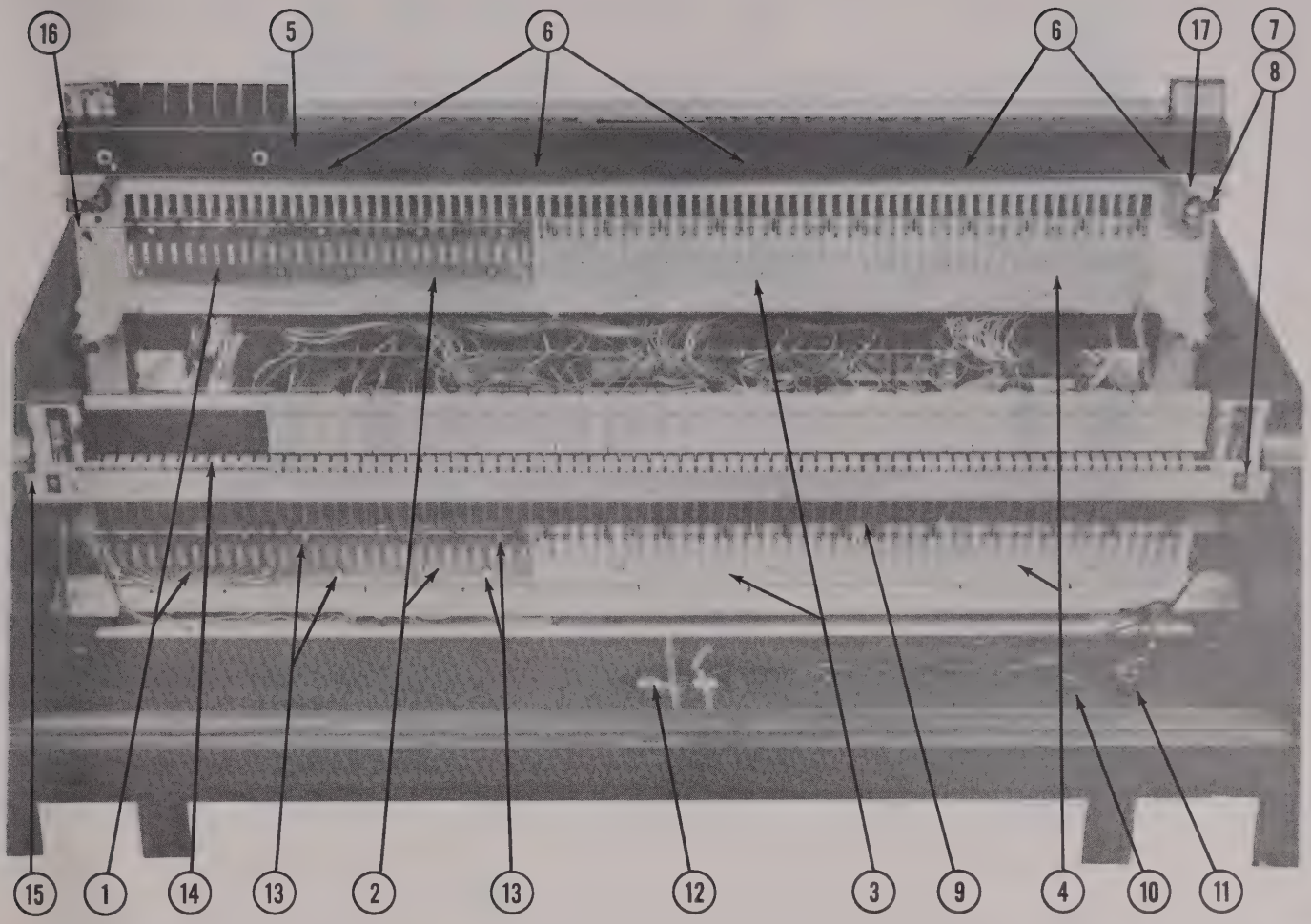
BENCH		104-000122
1	Hinge (2ea)	032-031396
2	Hinge Screws (12ea)	879-050931
3	Leg Band (8ea)	032-054302
4	Pin for leg band (8ea)	032-037229
5	Lid Support (1ea)	032-033231
6	Screws (1ea)	801-051131
7	Screw (2ea)	880-040931
8	Bumper rubber (2ea)	043-049938
9	Glides (4ea)	032-030741
10	Legs (2ea)	050-004313
11	Legs (2ea)	050-004314
12	Leg stretcher Bar Right side (1ea)	050-004309
13	Leg Stretcher Bar Left Side (1ea)	050-004308
14	Heel rest	050-004311
15	Bottom Panel	050-004312
16	Back Rail	050-004305
17	Front Rail	050-004304
18	End Assy. R/H	050-004303
19	End Assy. L/H	050-004302
20	Top Panel	050-004301



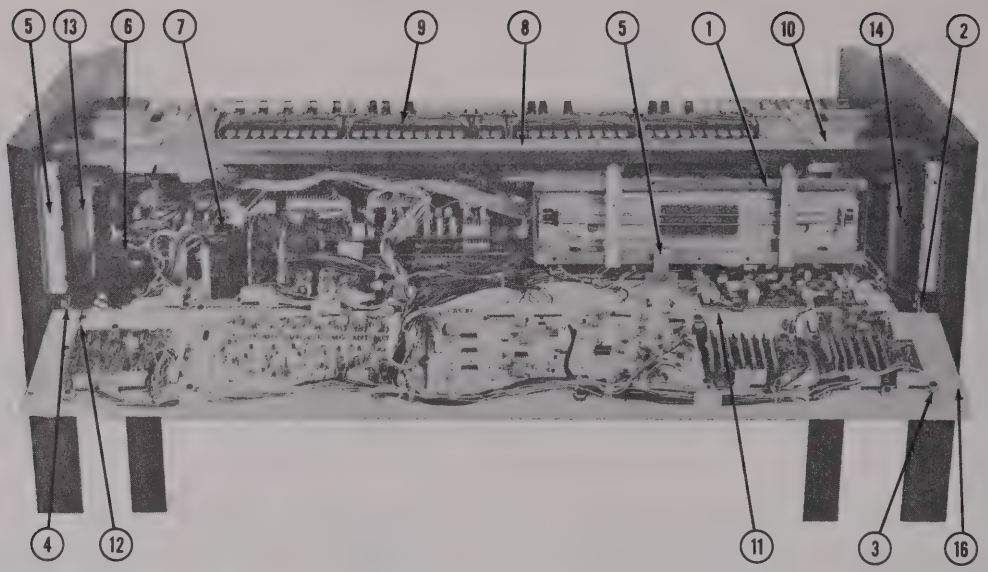
1	STOP SWITCH BASE ASSY.	120-000095-001
	Drawbar Base Assy.	061-053933
2	CONTROL ROCKER TABS	
	Switch (14 used)	008-054175
	Vibrato On - (Cap Only)	031-054161-001
	Vibrato Small-(Cap Only)	031-054161-002
	Vibrato Delay-(Cap Only)	031-054161-003
	Chorus On - (Cap Only)	031-054161-004
	Leslie Rotor- (Cap Only)	031-054161-005
	Leslie Upper- (Cap Only)	031-054161-006
	Leslie Lower- (Cap Only)	031-054161-007
	2nd Harmonic- (Cap Only)	031-054161-008
	3rd Harmonid- (Cap Only)	031-054161-009
	Percussion Fast- (Cap Only)	031-054161-010
	Electric Piano- (Cap Only)	031-054161-011
	Grand Piano - (Cap Only)	031-054161-012
	Key Click - (Cap Only)	031-054161-013
	Pedal Sustain - (Cap Only)	031-054161-014
	Pedal Mute - (Cap Only)	031-054161-015
2A	MOMENTARY SWITCH	008-054166
	Leslie Fast Led "Red"	001-026120
	Mounting Collar for LED	013-060620
	Mounting Clip for LED	013-060619

3	RIGHT HAND FILLER BLOCK	050-004256
	Keyhole Lock	035-051070
	Screws for Keyhole Lock	879-051138
	Screws to secure Filler Block	940-061138
4	LEFT HAND FILLER BLOCK	050-004256
	Keyhold Lock	035-051070
	Screws for Keyhole Lock	879-051138
	Screws to secure Filler Block	940-061138
5	UPPER MANUAL A#, B DRAWBARS LOWER MANUAL A# DRAWBARS	120-000070
6	PEDAL DRAWBARS	120-000097
7	LOWER MANUAL B DRAWBAR	120-000096
	DRAWBAR ASSEMBLY	
	Upper Manual B Drawbar	120-000070
8	ENDBLOCK UPPER RIGHT HAND	
	Complete Endblock Assy.	125-000183
	Cable Assy	011-053913
	Shim	033-052694
	Shield Line Switch	034-054636
	Endblock U.R.H.	050-042797
9	ENDBLOCK ASSY. LOWER RIGHT HAND	
	Wood Endblock	061-054183
	Entire Assy.	125-000184
	Felt Pad	042-053136
	Slide Pot 5K Ohm Reverb w/Screws	676-053143
	Wire and Connector Assy.	011-053985
	Bracket Slide Pot	035-053274
	Screw	885-030538
	Shim	033-052694
	Knob	025-054074
	Switch Leslie "ON" Reverb	008-053248-001
10	ENDBLOCK ASSY. LOWER LEFT HAND	
	Wood Endblock Silk Screened	061-054171
	Complete Assy.	125-000186
	Transposer Switch	008-054156
	Cable Assy.	011-053986
	Screw Hex	885-030538
	Shim	033-052694
	Knob	025-054074
	Felt Pad	042-053136
11	UPPER LEFT HAND ENDBLOCK	
	Complete Endblock Assy.	125-000185
	Wood Endblock Silk Screened	061-054177
	Felt Pad	042-053136
	Slide Pot 5K Ohm Sustain	676-053143
	Cable Assy	011-053987
	Bracket Slide Pot	035-053274
	Screw	885-030538
	Shim	033-052694
	Knob	025-054074
	Insulator	036-054221

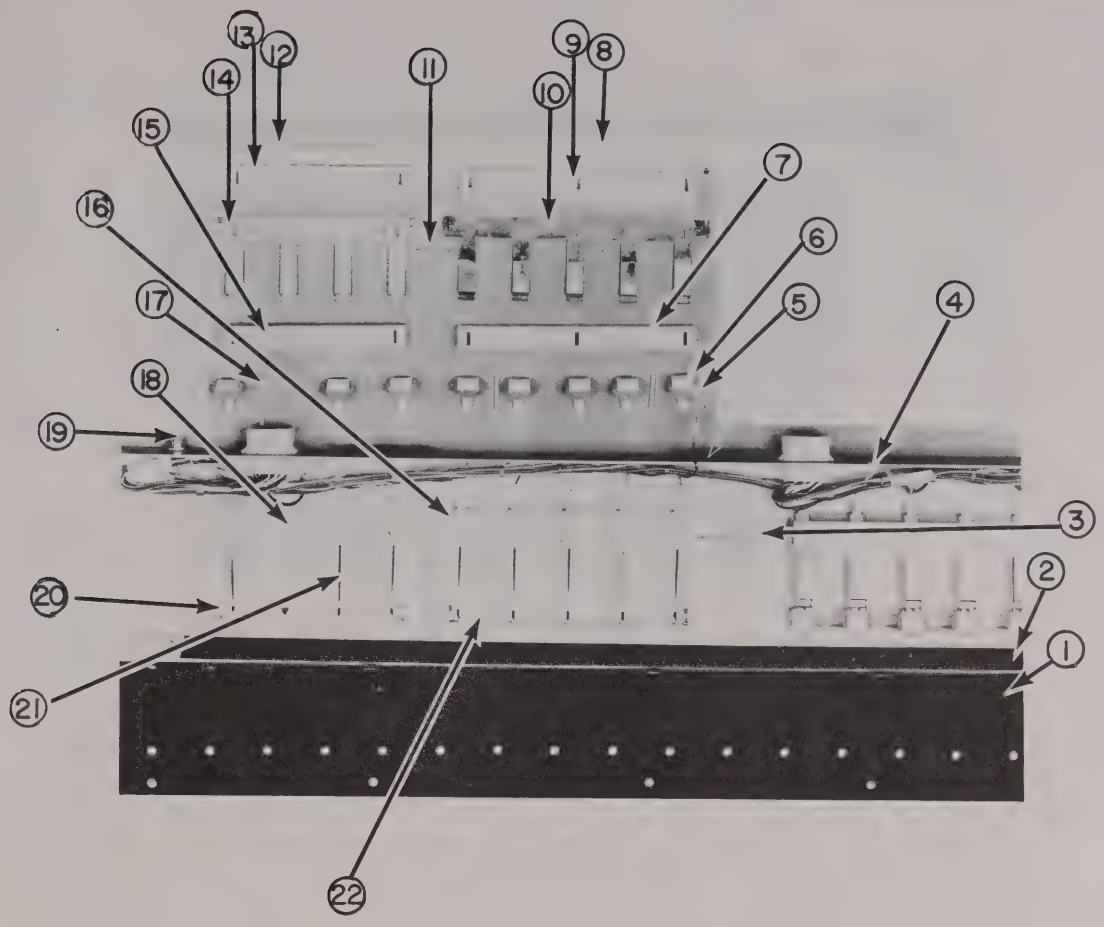
12	CX KEY MODULE	057-054075-005
13	C TO E KEY MODULE	057-054077-005
14	F to B KEY MODULE	057-054076-005
15	LOWER MANUAL PRESET KEYS	
	C to E Module	057-054149
	F to B Module	057-054148
16	UPPER MANUAL PRESET KEYS	
	C to E Module	057-054153
	F to B Module	057-054152
17	HAMMOND LOGO	037-052752
18	POWER CORD	011-053914
19	PEDAL SWITCH	116-000034
20	Outlet Box	129-000009
	AC Receptacle	005-053415
	Cable and Socket Tone Cab. Assy.	011-053912
	Socket 11 pin	005-053415
21	U/M & L/M Hold Down bolts	830-121814
	Washer	999-000104
22	Leg Bands (6ea)	032-054048
	Leg Bands (2ea Lower Rear)	032-054303
	Screws	888-030737
23	Left support bracket	035-045689
	Hinge	032-046418
	Screw for Hinge	831-080414
24	Right Support Bracket	035-045690
	Hinge	032-046418
	Screw for Hinge	831-080414
25	Front Strip	041-053925
	Screws (5ea)	940-060538
26	Swell Pedal (SEE REFERENCE FOR BREAK DOWN)	123-000091
27	Pedal Block	050-004257
28	Drawbar Spacer Cap	025-053921
29	Screws (3 per drawbar assy)	827-041718
	Washer (For item 28)	999-000016
30	Front Rail	050-004280



1	Keying PWB	023-045697-002
2	Keying PWB	023-045696-002
3	Keying PWB	023-045695-003
4	Keying PWB	023-045694-003
5	Front Strip	041-053925
6	Screw (5ea)	940-060538
7	Speed Nut	999-046046
8	U/M & L/M Hold Down Bolts	830-121814
	Washers	999-000104
9	Key Actuator	025-047278
10	Phono Jack 1/4" (Headphone)	005-049363
11	Phono Jack 1/4" (Auxiliary)	005-025532
12	Pedal Light Assy.	016-051360
	Switch	008-047882
	Bulb	016-051357
	Light Adaptor Housing	059-031616
13	Screws	926-050938
	Spacers Inserts	041-051189
	Rubber Bumpers Insulators	043-051190
14	Cancel Assy.	060-046018
	Return Spring	012-028799
15	Lower Manual Assy.	119-000088-001
16	Upper Manual Assy.	119-000087-001
	Up stop felt	042-045671
	Down stop felt	042-045677
17	U/M Support Bracket (2ea)	035-046047

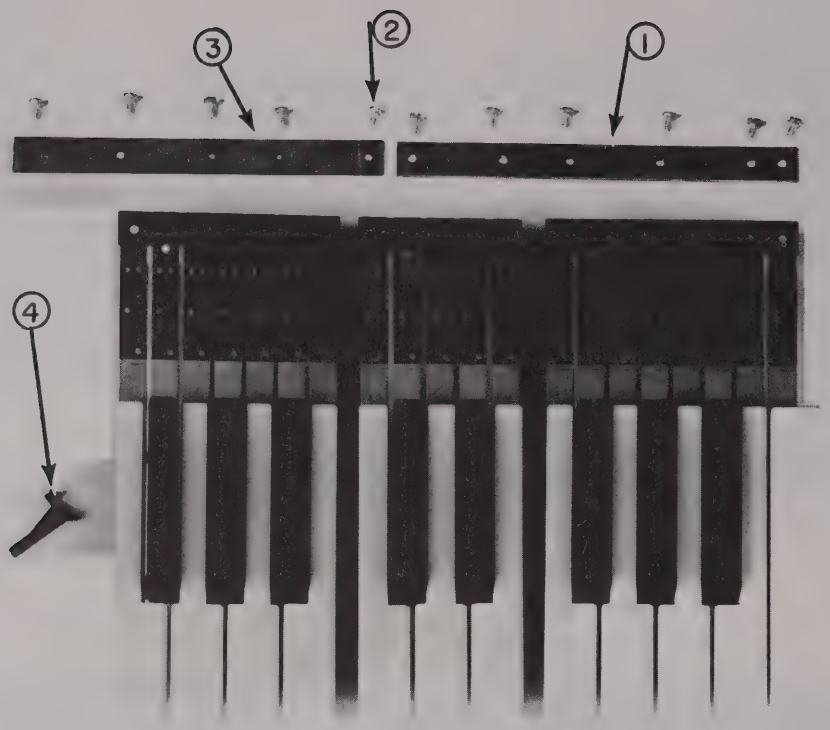


1	Reverb Spring Assy.		121-000208
	Spring Assy. Only		121-000131
	PWB		124-000526
	Brackets	(2 ea)	035-031466
	Rubber Grommets		043-023844
2	Leg Caps		026-054053
3	PWB Mount. Bumper		043-053338
	Screw		885-051538
	Washer		999-000066
	Nylon Tape		039-053700
4	Leg Caps		026-054053
5	Block		035-053220
6	Transformer	110V/60HZ	003-053952
	Transformer	220V/50-60HZ	003-053953
7	Heat Sinks	Power Supply PWB	041-054100
8	Top Rail		050-004282
9	Screws for Drawbar		927-041714
10	Shims		032-023287
11	Hinge		032-047796
12	Support Cable Swingout panel		266-0000266-1PP
13	Right Support Bracket		035-045690
14	Left Support Bracket		035-045689
15	Reverb Stop Bracket		041-047669
16	Swing Panel		050-004299



PEDAL SWITCH ASSEMBLY 116-000034

1	Felt Down Stop	042-030119
2	Felt Adhesive Backed	042-035149
3	Bus Rod "Long"	029-045429
4	Chassis	041-046081
5	Pad Actuator	043-052749
6	Actuator	025-045451
7	Spacer Actuator Spring "Long"	025-045445
8	Locking Pin "Long"	025-045575
9	Cap Switch Module "Long"	025-045447
10	Spring Return "Long"	030-045433
11	Bus Rod "Short"	029-045428
12	Locking Pin "Short"	025-045576
13	Cap Switch Module "Short"	025-045448
14	Spring Return "Short"	030-045434
15	Spacer Actuator Spring "Short"	025-045446
16	Base Switch Mounting	025-045443
17	Locking Pin	025-045577
18	Base Switch Mounting	025-045444
19	Ball Stud & Washer	044-043496 - 999-000046
20	Switch Glide "Short"	025-045450
21	Contact Spring Assy.	030-045436
22	Switch Guide "Long"	025-045449



PLAYING KEYS INDIVIDUAL NATURALS

A	Key	Ivory	025-053548-001
B	Key	Ivory	025-053549-001
C	Key	Ivory	025-053543-001
D	Key	Ivory	025-053544-001
E	Key	Ivory	025-053545-001
F	Key	Ivory	025-053546-001
G	Key	Ivory	025-053547-001
CX	Key High C	Ivory	025-053550-001
	Sharps	Black	025-053538
	Pal Nut Fastner		013-053247
C to E	Key Module		057-054077-005
F to B	Key Module		057-054076-005
F to CX	Key Module		057-054075-005

MISCELLANEOUS PARTS

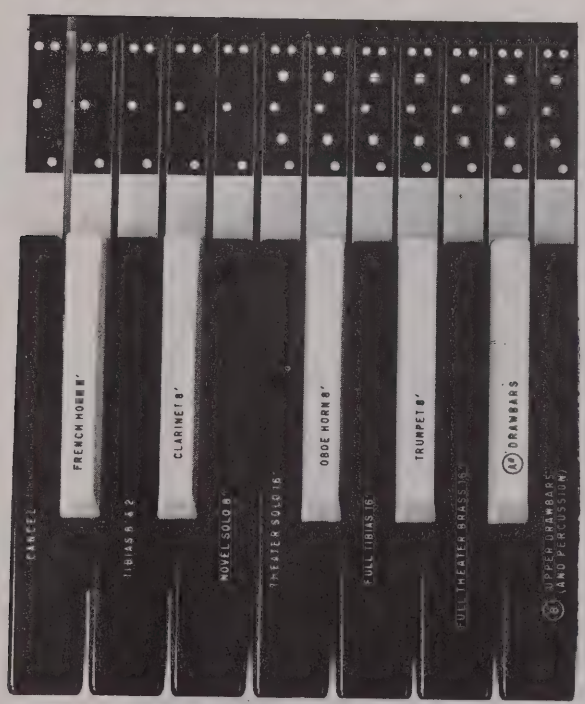
1	Clamp Strip	041-045358
2	Taptite Screw	926-050534
3	Clamp Strip	041-045357
4	Switch Actuator	025-047278

INDIVIDUAL PRESET KEYS U/M

C	Cancel	Black	025-054095
C#	French Horn 8'	Ivory	025-054126
D	Tibia 8' & 2'	Black	025-054099
D#	Clarinet 8'	Ivory	025-054127
E	Novel Solo 8'	Black	025-054100
F	Theatre Solo 16'	Black	025-054101
F#	Oboe Horn 8'	Ivory	025-054128
G	Full Tibia 16'	Black	025-054102
G#	Trumpet 8'	Ivory	025-054129
A	Full Theatre Brass 16'	Black	025-054103
A#	A# Tonebars	Ivory	025-054130
B	B Tonebars	Black	025-054104

PRESET KEY MODULES U/M

C to E	Key Module	057-054153
F to B	Key Module	057-054152

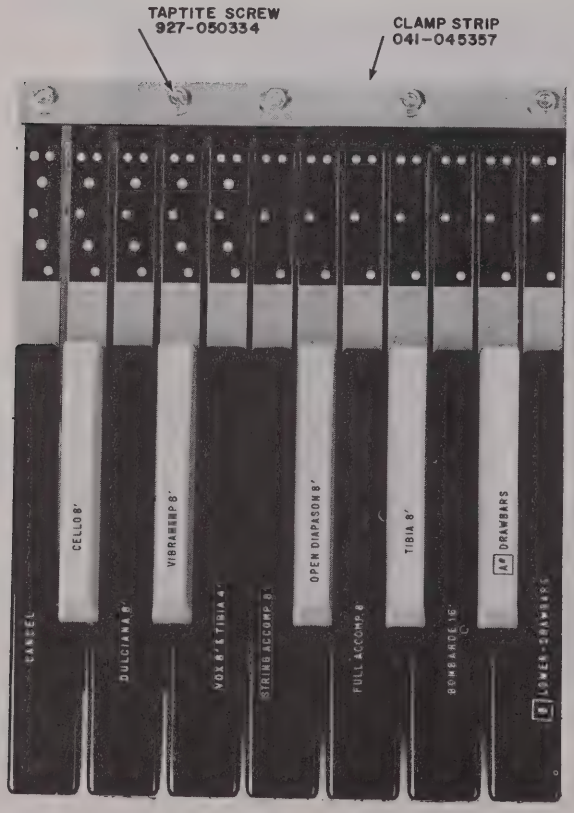


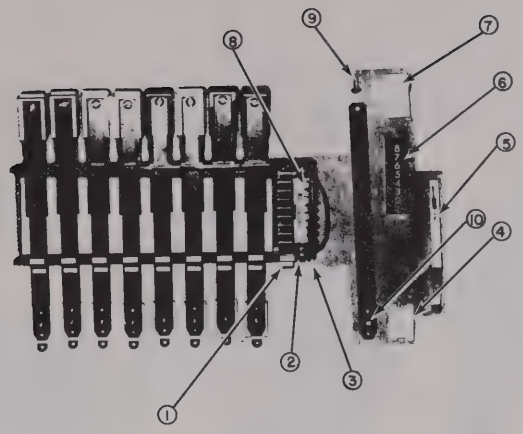
INDIVIDUAL PRESET KEYS L/M

C	Cancel	Black	025-054106
C#	Cello 8'	Ivory	025-054132
D	Dulciana 8'	Black	025-054107
D#	Vibraharp 8'	Ivory	025-054133
E	Vox 8' & Tibia 4'	Black	025-054108
F	Sting Accomp 8'	Black	025-054109
F#	Open Diapason 8'	Ivory	025-054134
G	Full Accomp. 8'	Black	025-054110
G#	Tibia 8'	Ivory	025-054135
A	Bombarade 16'	Black	025-054111
A#	A# Tonebars	Ivory	025-054136
B	B Tonebars	Black	025-054112

PRESET KEY MODULES L/M

C to E Key Modules	057-054149
F to B Key Modules	057-054148





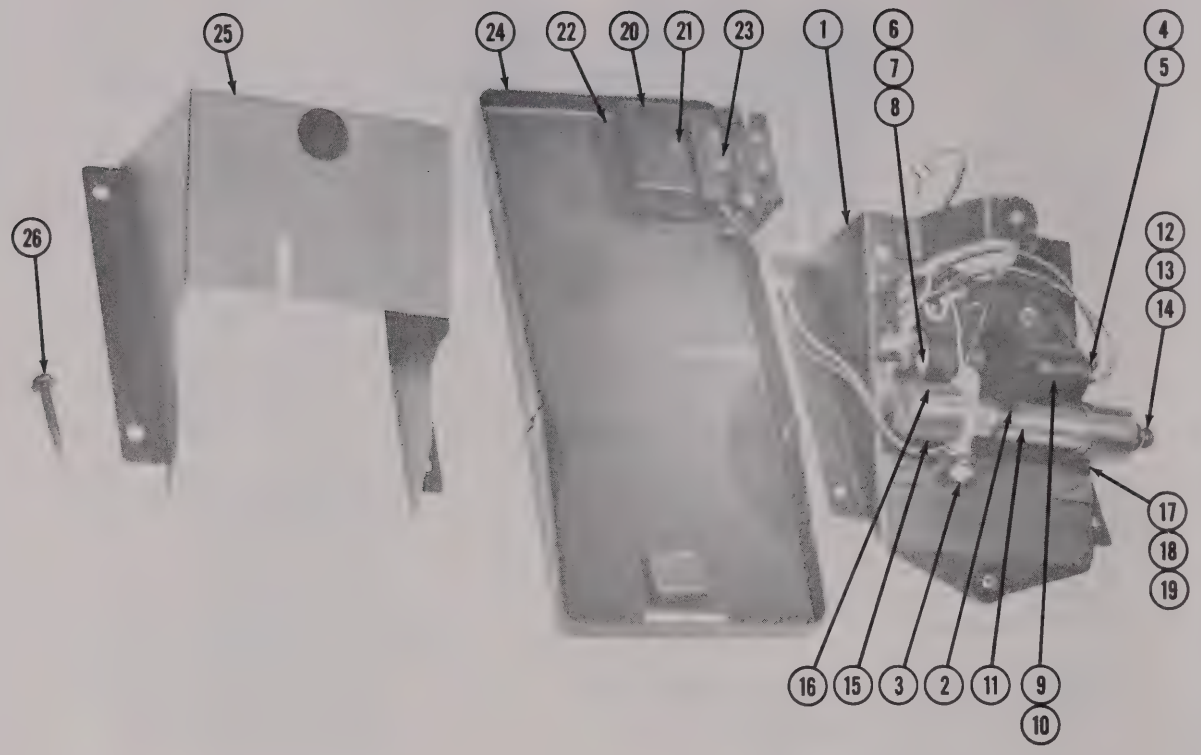
DRAWBAR ASSEMBLIES

	Upper Manual B Drawbars	120-000070
	Upper Manual A# Drawbars	120-000070
	Lower Manual B Drawbars	120-000096
	Lower Manual A# Drawbars	120-000070
	Pedal Drawbars	120-000097
1	Clamp Spring	012-027613
2	PWB= Printed Network & Mtg. Blk	063-045732
3	Double Ended Terminal	007-046423
4	Drawbar Stop	025-040198
5	Contact Spring Assy. Upper Manul B & A#, Lower Manual A# & Pedal	012-045727-002
6	Stop Channel	025-045727-002
8	Couplet "Printed Network"	058-045728
9	Screw	901-030514
10	Screw	939-010434
	L/M B Drawbar Contact Spring Assy.	012-033222
	L/M B Drawbar Couplet & Printed Network	058-031046

7	Upper Manual B, A#, Lower Manual A# & Drawbar Knobs	
	16' Beige	031-034347
	5-1/3' Beige	031-034349
	8' Ivory	031-034333
	4' Ivory	031-034338
	2-2/3' Black	031-034339
	2' Ivory	031-034340
	1-3/5' Black	031-034341
	1-1/3' Black	031-034342
	1' Ivory	031-034343

Lower Manual B Drawbars	
16' Brown	031-034331
16' Beige	031-034347
8' Brown	031-034334
8' Beige	031-034348
4' Brown	031-034350
4' Beige	031-034351
2' Brown	031-034352
2' Beige	031-034353
1' Brown	031-034354

Pedal Drawbars	
16' Beige	031-034347
8' Beige	031-034348



ITEM #	SWELL PEDAL		123-000091
1	Pedal Bracket Assy.		060-032636
2	Shutter		041-043035
3	Spring Return		012-030154
4	Bulb	28V	016-031751
5	Socket		016-031751
6	Photocell		004-053160
7	Photo Cell Holder		040-045400
8	Diffuser		016-030153
9	Photocell Housing Upper		025-045477
10	Photocell Housing Lower		040-052710
11	Pedal Shaft		020-021725
12	Screw		833-100518
13	Lock Washer		999-000733
14	Flat Washer		999-000083
15	Bearing bracket	(2ea)	035-031429
16	Bearing Bracket with Pow	(2ea)	035-031428
17	Screw		843-081113
18	Nut Square		999-001343
19	Washer		999-000729
20	Switch Cover		041-042722
21	Selftap Head Screw		927-031138
22	Down Stop Bumper		025-040138
23	Slide Pedal & Switch Assy		060-052704
24	Pedal and Mat. Assy.		060-030149-001
	Mat		043-046347
25	Shroud		041-032081
26	Wood Screw		885-081838

SEE B3000 SCHEMATIC
FOR ADDT'L. PWB COMPONENTS

440 GENERATOR PWB		124-000508
Transistor		
Q8	PNP	001-021172
Q6, Q7	NPN	001-021310
Diodes	ALL	001-026080
Integrated Circuits		
IC1 through 4		075-000440
IC5		075-000220
Capacitor (Tantalum)	4.7MFD 35 V 30%	435-475354
Coil		
L1		003-051656
TIME CONSTANT PWB		124-000509
Transistors	ALL	001-022103
Diodes	ALL	001-022103
PEDAL TIME CONSTANT PWB		124-000510
Transistors	ALL	001-022103
Diodes	ALL	001-226680
POWER SUPPLY PWB		124-000511
Transistor		
Q5		001-021320
Q1, Q3		001-021314
Q2, Q4		001-021232
Diode		
D1 - D4		001-024061
D5, 6, 7		001-226080
Capacitor (Tantalum)		
C5, 6	1MFD 35V	414-250092
C1	.1MFD 35V	414-250012
Capacitor (Electrolytic)		
C8	22MFD 50V	432-256509
C2, 3	2000/2200MFD 50V	434-208509
Transformer	120V/60HZ	003-053915
	100V/50/60HZ	003-053916
	220V/50/60HZ	003-053916
	240V/50/60HZ	003-053916
Integrated Circuits		
IC1		075-027824
IC2		075-017924
IC3		075-017912

POWER SUPPLY PWB (CONTINUED)		124-000511
Fuse		
F1, 2, 3,	1. SASB	016-040425
Fuse Clip (6 each)		013-050528
Heat Sink		041-054100
Connector Receptacle		
J517		005-052882
J518		005-054200
PRESET PWB		124-000512
Transistors	ALL PNP	001-021172
Diodes	ALL	001-226080
BRIGHT WAVE PWB		124-000513
Transistors		
Q1		001-021314
Q2		001-021314
Q3, 4		001-021172
Q5	N-J FET	001-027030
Diodes	ALL	001-026080
Integrated Circuits		
IC1, 2, 3		075-004069
IC4		075-004011
IC5	OP Amp	075-000090
Capacitors (Electrolytic)		
C34, 43	200MFD 35V	431-207359
C6,8,13,15,20,22,26,28,32	10MFD 50V	432-106509
Potentiometer Trimmer		
R96	250K	676-000077
OUTPUT PWB		124-000514
Transistors		
Q16,17		001-021133
Q11		001-021172
Q1,2,3,5,6,7,8,10,14		001-021260
Q4, 12, 13,15		001-021314
Diodes	ALL	001-226080
Integrated Circuits		
IC1,2,4		075-004016
IC3, 9		075-004011
IC7		075-004040
IC5, 6	OP Amp	075-000090
IC8		075-004046
IC11		075-004013
IC10		075-003004

OUTPUT PWB (CONTINUED)		124-000514
Capacitors (Electrolytic)		
C19, 5, 41,2	4.7MFD 50V	431-056509
C27	10MFD 50V	431-106509
C35	100MFD 25V	431-107259
C36	470MFD 35V	431-507359
C37	10MFD 50V	432-106509
C57, 59,44	47MFD 25V	432-506259
C44	100MFD 15V	432-107159
Potentiometer Trimmer		
R48	5K	676-000061
R70	20K	676-000065
R62, 36,58	50K	676-000069
R120, 101	500K	676-000080
Capacitors (Tantalum)		
C46	.22MFD 25V	414-240032
C56,26	.33MFD 25V	414-240042
C32,9,50	2.2MFD 25V	414-240112
C34,31	4.7MFD 25V	414-240132
C7, 43	.47MFD 35V	414-250052
C17	1.0MFD 35V	414-250092
PERCUSSION AND PEDAL PWB		124-000515
Transistors	ALL	001-021260
Diodes	ALL	001-226080
Integrated Circuits		
IC1		075-004066
Capacitors (Electrolytic)		
C68,73,66,94	4.7MFD 50V	431-056509
C72	10MFD 50V	432-106509
C97	100MFD 15V	432-107159
Capacitors (Tantalum)		
C74, 70	.47MFD 25V	414-240052
Capacitors (Poly Picpylene)		
C53	180MMFD 5%	437-010011
C37, 45	560MMFD	437-010021
C29	820MMFD	437-010031
C21	.0012MFD 5%	437-010041
C5, 13,51,65,52	.0015MFD	437-010051
C35,36,44,43	.0047MFD	437-010061
C27, 28	.0068MFD	437-010071
C19, 20	.01MFD	437-010081
C34,11,12	.012MFD	437-010091
C63	.027MFD	437-010101
C62	.039	437-010111
Potentiometer Trimmer		
R123	20K	676-000065
R97, 95	50K	676-000069

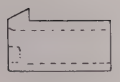
LOGIC PWB		124-000516
Transistors		
Q16,21,22,25		001-022103
Q20, 23		001-021172
Q24		001-021260
Q6, 8, 10, 12,13,14,15,17,18,19		001-021314
Q1,2,3,4,5,7,9,11		001-022114
Integrated Circuits		
IC3		075-004022
IC1,4,7		075-004011
IC5, 6		075-004001
IC2		075-004013
TRANSPOSER PWB		124-000517
Integrated Circuit		
IC1, 2		075-004001
IC3		075-004046
IC4		075-004040
U/M & L/M Sine Filters PWB		124-000518
Transistor		
Q1		001-021260
Capacitor (Electrolytic)		
C15	4.7MFD 50V	431-056509
Capacitor (Tantalum)		
C8	.47MFD 25V	414-240042
C9	.33MFD 25V	414-240052
Printed Network		
#1		058-053691
#2		058-053692
#3		058-053693
#4		058-053694
#5		058-053695
#6		058-053696
#7		058-053697
MULTIPLEXER PWB		124-000520
Transistor		
Q1 thru Q9		001-022114
Diodes	ALL	001-226080
Integrated Circuits		
IC3,4,5,6,7		075-004052
IC1, 2		075-004066
Capacitors (Electrolytic)		
C6	22MFD 50V	431-256509
Capacitors (Tantalum)		
C47,48	4.7MFD 35V	435-475354

DE-MULTIPLEXER PWB		124-000521
Transistor		
Q15,16,17		001-021260
Q1 thru Q14		001-022114
Diodes	ALL	001-226080
Integrated Circuits		
IC1,2,3,4		075-004052
Capacitors (Electrolytic)		
C45	200MFD 35V	431-207359
C44	470MFD 35V	431-507359
C1 thru C7	470MFD 6.3V	432-507069
Potentiometer (Trimmer)		
R24	5K	676-000061
KEY CLICK PWB		124-000523
Integrated Circuit		
IC2		075-000300
IC5		075-004001
IC1, 3, 4		075-004007
Diode	ALL	001-226080
Capacitors (Electrolytic)		
C9	47MFD 25V	432-506259
Capacitors (Tantalum)		
C1, 3, 6, 11	2.2MFD 25V	414-240112
Potentiometer Trimmer		
R33	50K	676-000069
CONTROL PWB		124-000527
Transistors		
Q1, 2		001-021172
Diodes	ALL	001-226080
Integrated Circuits		
IC1, 2		075-004066
IC3		075-004071
Capacitors (Electrolytic)		
C1	10MFD 50V	432-106509
Potentiometer Trimmer		
R37	20K	676-000065
LESLIE CROSSOVER PWB		124-000535
Transistor		
Q1, 2		001-021260
Capacitor Tantalum		
C8	.22MFD 25V	414-240032
C4	.33MFD 25V	414-240042

MISCELLANEOUS PLUG CONNECTORS

PLUG	PIN CONNECTIONS
005-044745	9
005-044746	4
005-044747	5
005-044748	6
005-044749	8
005-044750	12
005-044751	18
005-044752	15
005-044753	24
005-044753-001	22

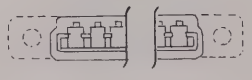
PIN TERMINAL 007-044744

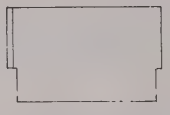


STRAIGHT ON PLUG PWB EDGE

005-043361	24
005-043363	22
005-043365	21
005-043367	20
005-043369	18
005-043371	15
005-043373	12
005-043375	9
005-043377	6

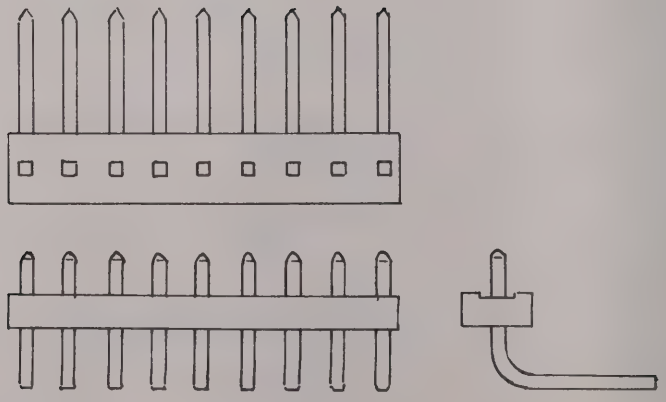
PIN # 007-043171



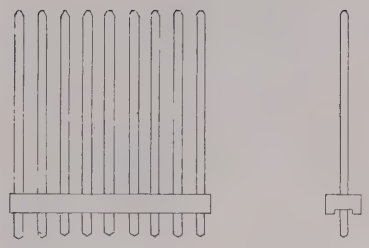


BENT PIN CONNECTORS

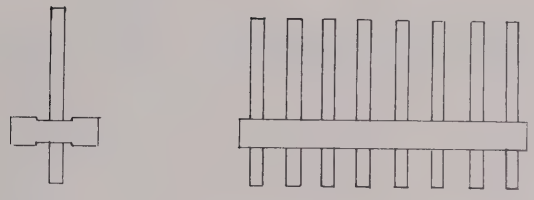
005-053400	9
005-053401	12
005-053402	6



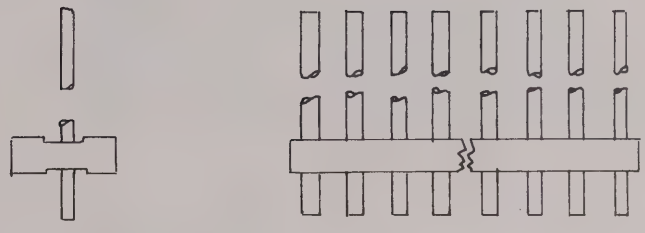
	NUMBER OF CIRCUITS "PINS"
005-054216-001	3
005-054216-002	6
005-054216-003	9
005-054216-004	12
005-054216-005	15
005-054216-006	18
005-054216-007	5



005-044532	9
005-044535	5
005-044536	10
005-044537	18

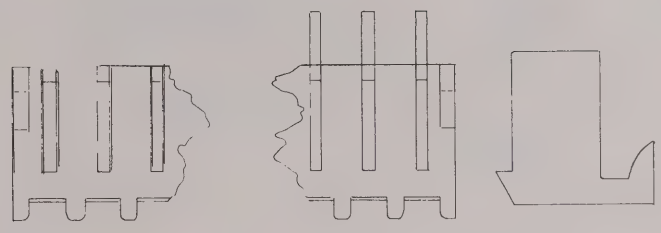


005-044738	12
005-044739	5
005-044740	7
005-044741	12
005-044742	6
005-044743-001	15
005-044744-001	4



PLUG WHICH MOUNTS ON PWB FEMALE

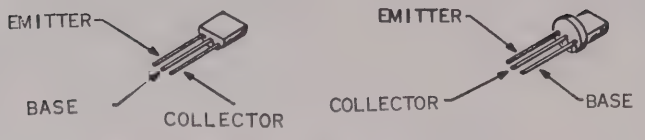
005-044729	9
005-044730	15
005-044731	3
005-044732	4
005-044733	6
005-044734	8
005-044735	10
005-044736	12
005-044737	14



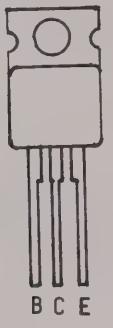
PINS 007-044744

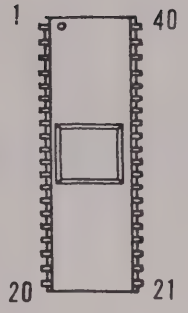
TYPICAL CRIMP STYLE TERMINAL 007-044744

HAMMOND PART NUMBER	VENDOR NUMBER
DIODES	
001-024061	IN4720
001-226080 or 001-026080	1N4148

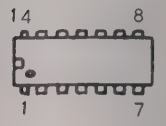


NOTE: BOTH STYLE TRANSISTORS CAN HAVE SAME PART NUMBER

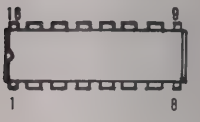


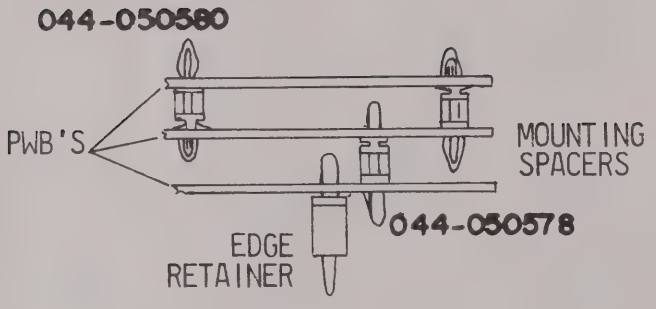


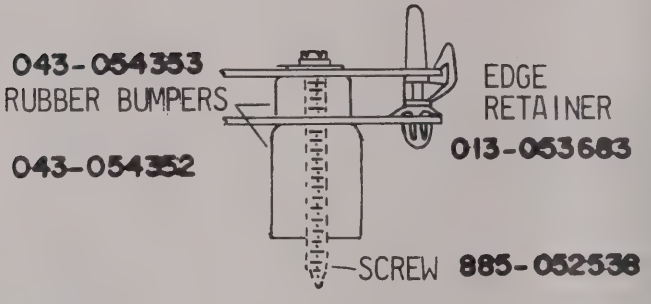
ALL 14 PIN ICS

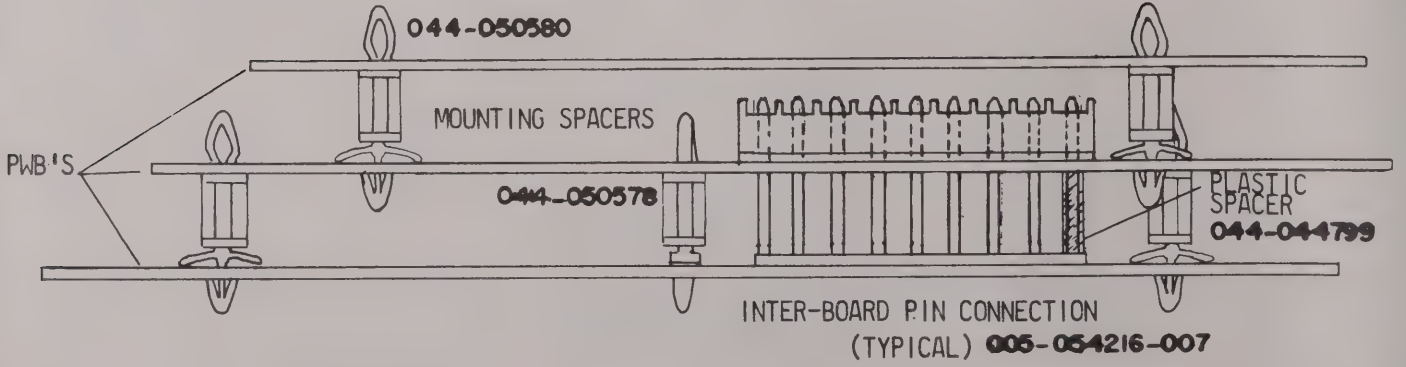


ALL 16 PIN ICS









HAMMOND CROSS REFERENCE CHART

HAMMOND PART NUMBER		VENDOR NUMBER
075-000090	OP-AMP	CA3741CS
075-000220		550240AMI-MK50240 MOSTEK
075-000300		MM5837N
075-000440		Special Hammond Only
075-003004		MN3004 Panasonic
075-004001		CD4001B RCA
075-004007		MC14007
075-004011		CD4011B RCA
075-004013		CD4013B RCA
075-004016		CD4016BE RCA - MC14016BCP Motorola
075-004022		MC4022B Motorola
075-004040		CD4040BE RCA
075-004046		CD4046BE RCA
075-004052		CD4052BE RCA
075-004066		MC14066 Motorola
075-004069		CD4069UBE RCA
075-004071		CD4071BE RCA MC14071BCP Motorola
075-017912	12V Reg. for -14V Supply	LM7912CT National NA7912VC Signetics
075-017924	-24V Reg.	LM7924CT National NA7924VC Signetics
075-027824	+24V Reg.	LM7824CT National NA78HV24VD Signetics
COUPLETS		
058-053691		HAMMOND ONLY
058-053692		HAMMOND ONLY
058-053693		HAMMOND ONLY
058-053694		HAMMOND ONLY
058-053695		HAMMOND ONLY
058-053696		HAMMOND ONLY
058-053697		HAMMOND ONLY
IC SOCKETS		
004-050500	14 Pin	
004-050501	16 Pin	
004-046770	40 Pin	
TRANSISTORS		
001-021133		2N3339
001-021134		2N3392
001-021172		2N4249
001-021232		2N3403
001-021260		2N5826
001-021310		2N4123
001-021314		2N3858
001-021320		D44C5
001-022032		2N5355
001-022103	Darlington Pair	GE D39c82 MOT MPSA64
001-022114		
001-027030		2N5163

HOOO-006089 5c 4/81

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HAMMOND ORGAN COMPANY GRAPHICS COMMUNICATIONS

Custom Leslie Speaker Designed Exclusively for the Hammond B-3000 Portable Organ

Leslie SPEAKERS

The Model HL-722 is a premier, all solid-state tone cabinet custom designed for the Hammond B-3000. Its two channel system drives treble and bass independently to reduce distortion and create a cleaner sound with wider, more dynamic projection. Integrated solid-state amps are rated at 215 W for plenty of reserve power. Sound attack is sharper, and clarity, especially of strings, is excellent.

LESLIE MODEL HL-722

5-1 GENERAL

This section contains schemtaic d
the Leslie model HL-722 servicin

5-2 SPECIFICATIONS

Cabinet:	Walnut
Amp:	Bass 70 Drum 45
Speaker:	15"(bass
Rotor Speed Control:	Fast (tre
Treble Response Switch:	Rotary (Stationar
Cable:	11 pin
Power:	AC 100
Dimensions:	29¾''W
Weight:	170 pou

B

2554
3414

140566
D4

G

3531

1
2

024, S25
026, S27
9

3, S16
3, S20, S29
1

E C
B
Q2, Q11
MSPS 4382

14 13 12 11 10 9 8
1 2 3 4 5 6 7
140505
IC1, IC2

067561
D12, D17
T1 G
T2

137756
S30, S31

023549
P24 P25,
P26, P27

023309
P7, P8, P9
P10, P11,
P12, P13,
P14

108660

7 6 5
8 4
9 3
10 2
11 1
P1
WIRE END

1
2
3
4
5
S7, S8, S9
S10, S11
S12, S13, S14

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HAMMOND ORGAN COMPANY GRAPHICS COMMUNICATIONS

APPENDIX

Custom Leslie Speaker Designed Exclusively for the Hammond B-3000 Portable Organ

Leslie SPEAKERS

The Model HL-722 is a premier, all solid-state tone cabinet custom designed for the Hammond B-3000. Its two channel system drives treble and bass independently to reduce distortion and create a cleaner sound with wider, more dynamic projection. Integrated solid-state amps are rated at 215 W for plenty of reserve power. Sound attack is sharper, and clarity, especially of strings, is excellent.

LESLIE MODEL HL-722

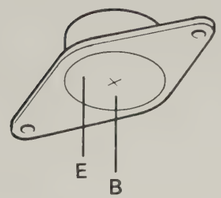
5-1 GENERAL

This section contains schemtaic diagram and text to illustrate and provide information necessory for the Leslie model HL-722 servicing.

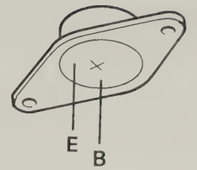
5-2 SPECIFICATIONS

Cabinet:	Walnut finish
Amp:	Bass 70 W (RMS), Treble 65 W (RMS), Drum 45 W (RMS), Horn 35 W (RMS)
Speaker:	15″(bass) 1, 6″×9″(mid-range) 3, Tweeter (treble horn rotor) 1
Rotor Speed Control:	Fast (tremolo)/Slow (choral)
Treble Response Switch:	Rotary (bright/middle/mellow), Stationary (bright/middle/mellow)
Cable:	11 pin
Power:	AC 100 V, 120 V, 220 V, 240 V 50/60 Hz
Dimensions:	29¾″W,21¼″D,41¼″H
Weight:	170 pounds

5-3 PARTS LIST

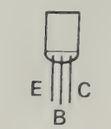


Q4, Q13, Q14
2N3055

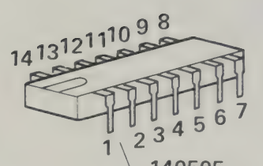


Q12
2N3054

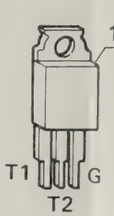
Q1- TZ554
Q3- 2N3414



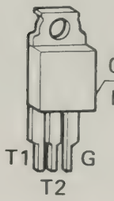
Q2, Q11
MSPS 4382



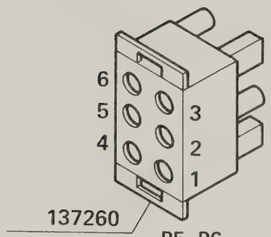
140505
IC1, IC2



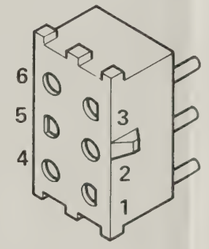
140566
D4



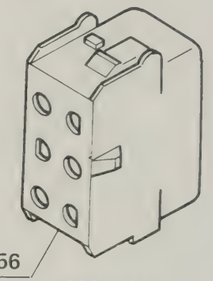
067561
D12, D17



137260
P5, P6,
P30, P31



S5, S6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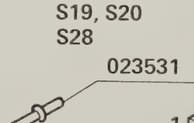
S30, S31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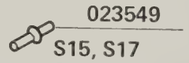
P28, P23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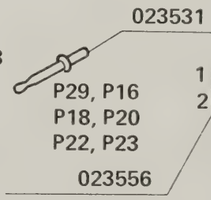
S15, S17
S19, S20
S28



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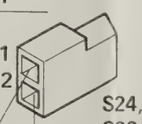
P29, P16
P18, P20
P22, P23
023556



S24, S25
S26, S27
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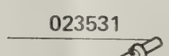

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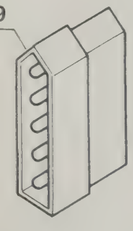
023549
P24 P25,
P26, P27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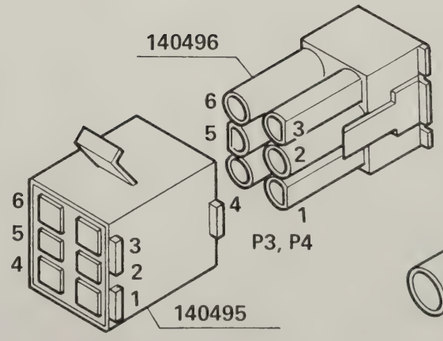
P7, P8, P9
P10, P11,
P12, P13,
P14



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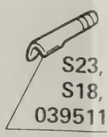
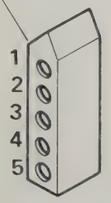
P3, P4
140495
S3, S4


S23, S16
S18, S20, S29
039511

P1
WIRE END

023556
S22



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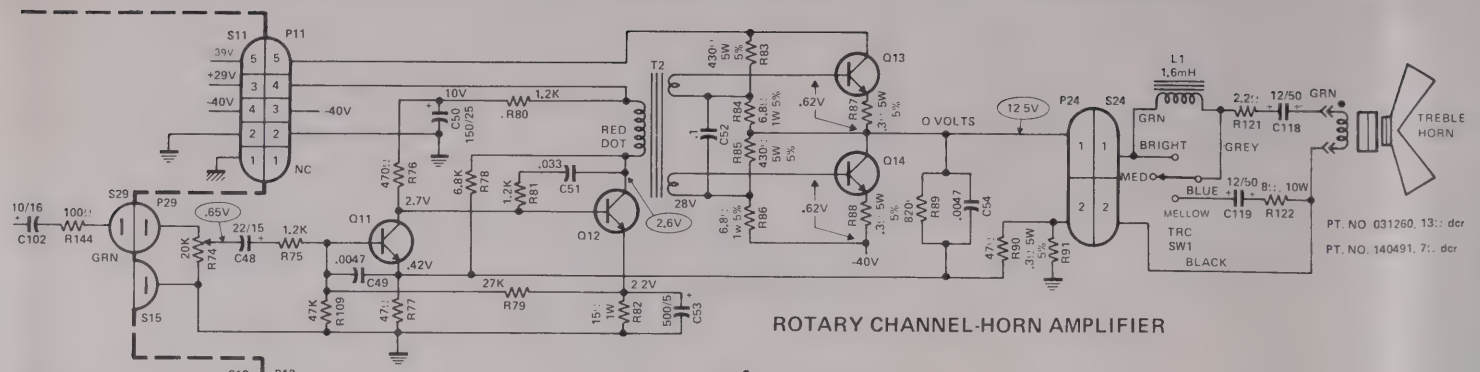
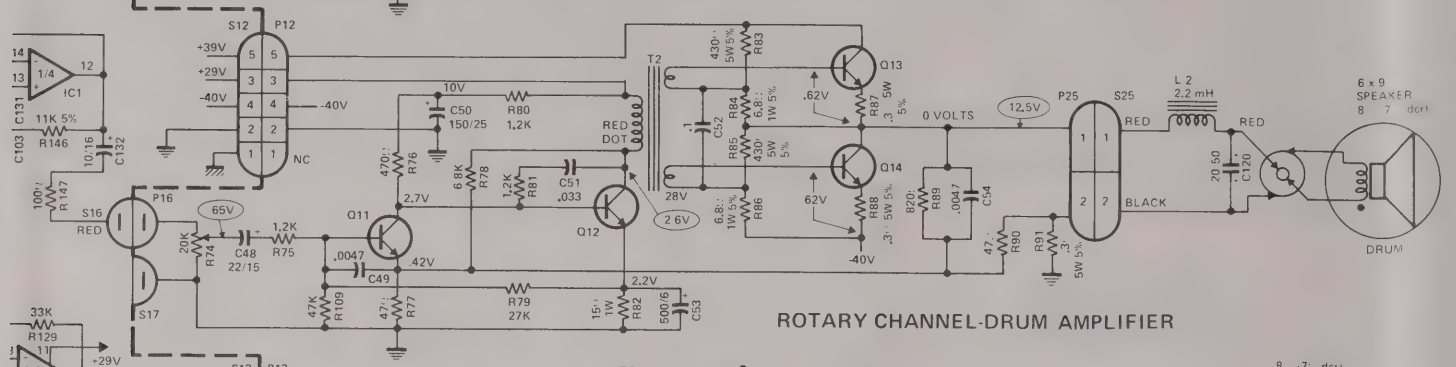
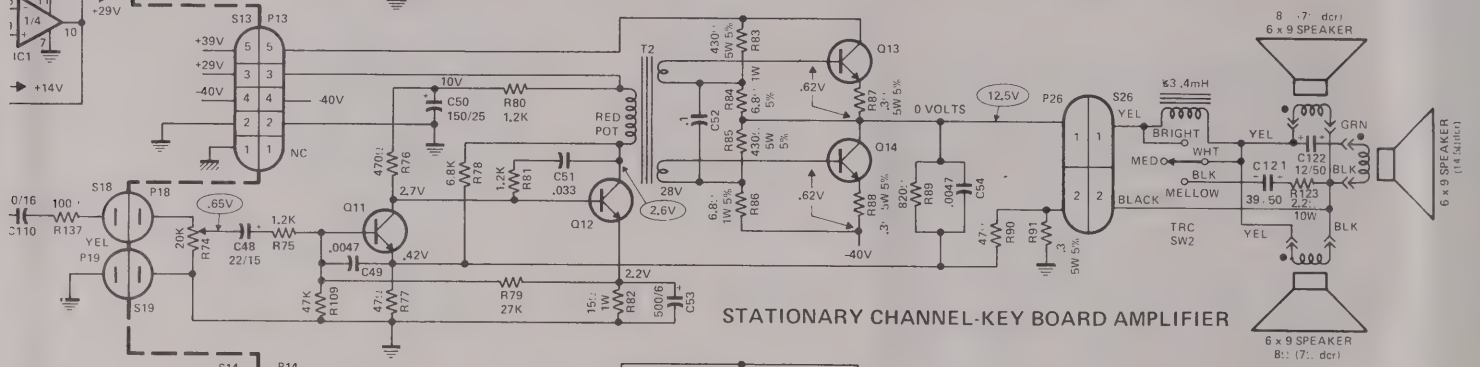
S7, S8, S9
S10, S11
S12, S13, S14



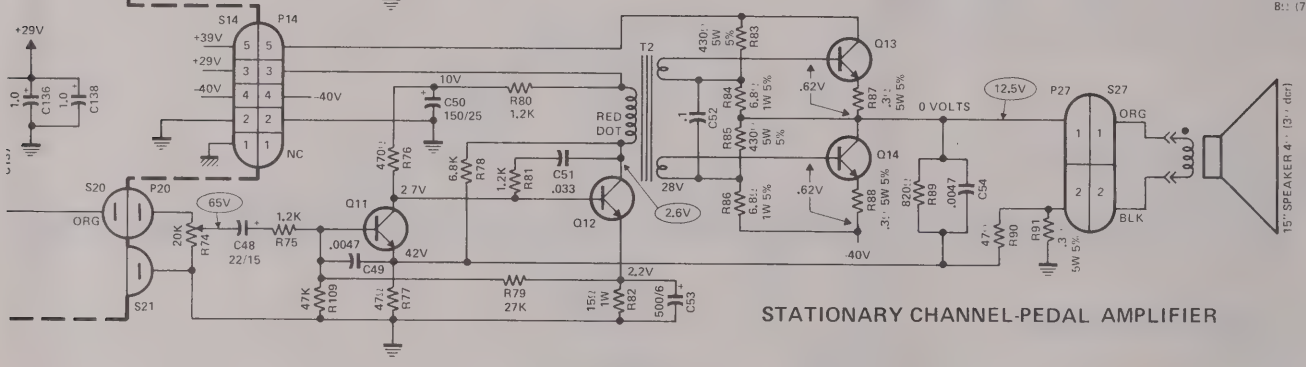
ROTARY CHANNEL-HORN AMPLIFIER



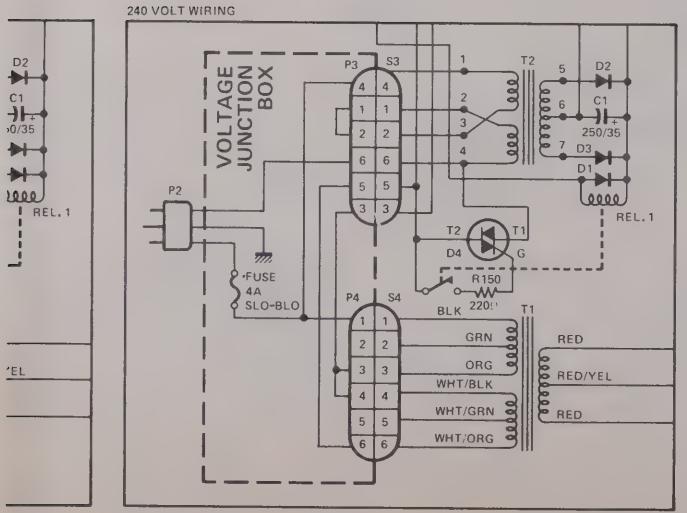
ROTARY CHANNEL-DRUM AMPLIFIER



STATIONARY CHANNEL-KEY BOARD AMPLIFIER



STATIONARY CHANNEL-PEDAL AMPLIFIER



NOTES:

1. AC LINE VOLTAGE TO BE AS INDICATED.
2. ALL POWER SUPPLY AND AMPLIFIER VOLTAGES ARE REFERENCED TO CIRCUIT GROUND UNLESS OTHERWISE INDICATED.
3. CONTROL CIRCUIT VOLTAGES ARE REFERENCED TO CONTROL SUPPLY COMMON. (P5 - PIN 1)
4. ALL DC VOLTAGES MEASURED WITH DC VTVM AT ZERO AUDIO SIGNAL.
5. P1-PIN 5 SHORTED TO PIN 6 FOR ALL TEST CONDITIONS.
6. SIGNAL TEST: (EACH AMPLIFIER SEPARATELY)
   - A. CONNECT 8:: LOAD IN PLACE OF SPEAKER LOAD.
   - B. SET R74 AT MINIMUM. APPLY APPROXIMATELY 2 VOLTS AT
     - a. 1KHz. FOR ROTARY HORN AMPLIFIER } INPUT TO P1-PIN 1
     - b. 200Hz. FOR ROTARY DRUM AMPLIFIER
     - c. 1 KHz. FOR STATIONARY KEYBOARD AMPLIFIER } INPUT TO P1-PIN 2
     - d. 100Hz. FOR STATIONARY DEDAL AMPLIFIER
   - C. FOR SIGNAL VOLTAGES NOTED ⬭ ADJUST R74 FOR 20 WATTS (12.5 VOLTS R.M.S.) ACROSS LOAD
   - D. ADJUST R74 FOR OUTPUT CLIPPING. VOLTAGE ACROSS LOAD SHOULD BE 20 VOLTS R.M.S. MINIMUM.
7. ALL RESISTORS ARE 1/2 WATT, 10% UNLESS OTHERWISE NOTED.
8. GROUND SYMBOLS:

CHASSIS GROUND — CIRCUIT GROUND

CONTROL CIRCUIT VOLTAGES

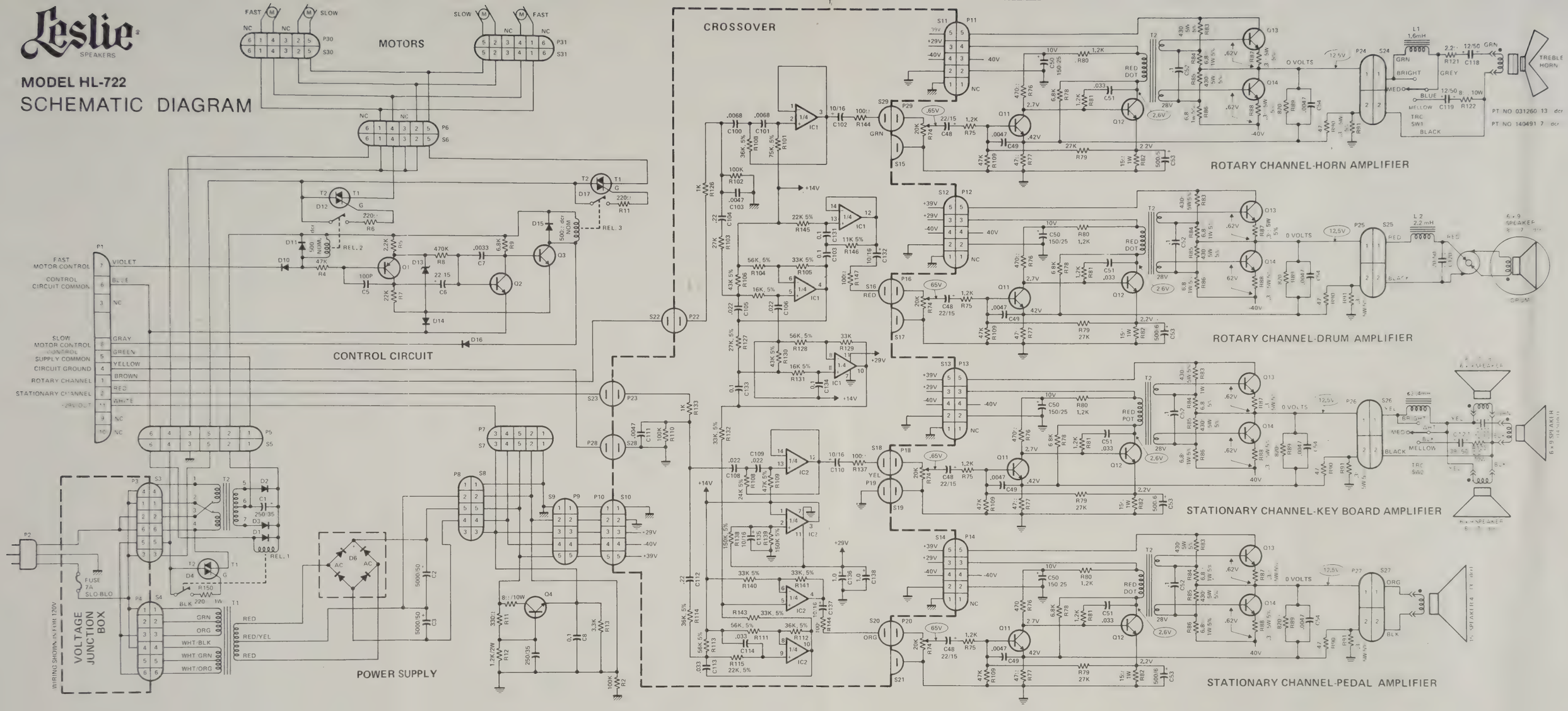
MOTOR MODE	P1,PIN =5 SHORTED TO:	B + P5=2	Q1			Q2			Q3			P1	
			E	B	C	E	B	C	E	B	C	=7	=8
OFF	PIN =6	17.2	7.2	15	.65	–	.67	.12	.65	.12	17.3	17.2	17.3
SLOW	PINS =6 & =8	16.5	7.2	15	.65	–	.67	.12	.65	.12	.78	16.8	0
FAST	PINS =6 & =7	16.5	7.2	6.7	7.3	–	.67	.124	.65	.124	16.5	0	16.6

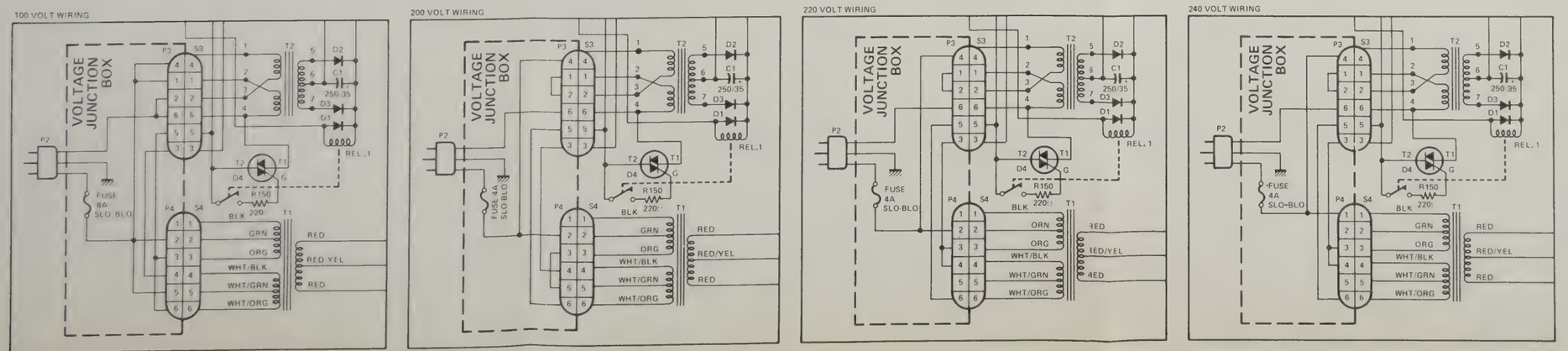
B-3000 SCHEMATIC DIAGRAM

Leslie SPEAKERS

MODEL HL-722

SCHEMATIC DIAGRAM





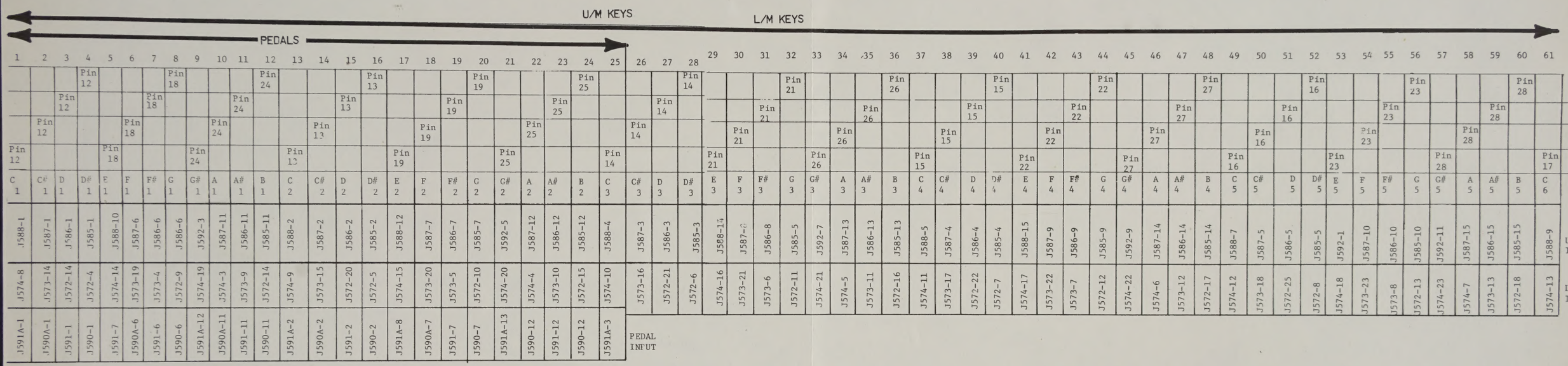
NOTES

1. AC LINE VOLTAGE TO BE AS INDICATED
2. ALL POWER SUPPLY AND AMPLIFIER VOLTAGES ARE REFERENCED TO CIRCUIT GROUND UNLESS OTHERWISE INDICATED
3. CONTROL CIRCUIT VOLTAGES ARE REFERENCED TO CONTROL SUPPLY COMMON (P5 - PIN 1)
4. ALL DC VOLTAGES MEASURED WITH DC VTVM AT ZERO AUDIO SIGNAL
5. P1-PIN 5 SHORTED TO PIN 6 FOR ALL TEST CONDITIONS
6. SIGNAL TEST: (EACH AMPLIFIER SEPARATELY)
   - A. CONNECT 8Ω LOAD IN PLACE OF SPEAKER LOAD
   - B. SET R74 AT MINIMUM. APPLY APPROXIMATELY 2 VOLTS AT
     - a. 1KHz. FOR ROTARY HORN AMPLIFIER } INPUT TO P1-PIN 1
     - b. 200Hz. FOR ROTARY DRUM AMPLIFIER
     - c. 1 KHz. FOR STATIONARY KEYBOARD AMPLIFIER } INPUT TO P1-PIN 2
     - d. 100Hz. FOR STATIONARY DEDAL AMPLIFIER
   - C. FOR SIGNAL VOLTAGES NOTED ⬭ ADJUST R74 FOR 20 WATTS (12.5 VOLTS R.M.S.) ACROSS LOAD
   - D. ADJUST R74 FOR OUTPUT CLIPPING. VOLTAGE ACROSS LOAD SHOULD BE 20 VOLTS R.M.S. MINIMUM
7. ALL RESISTORS ARE 1/2 WATT, 10% UNLESS OTHERWISE NOTED
8. GROUND SYMBOLS

CHASSIS GROUND ⏚ CIRCUIT GROUND

CONTROL CIRCUIT VOLTAGES

MOTOR MODE	P1,PIN 5 SHORTED TO	B+ P5-2	Q1			Q2			Q3			P1	
			E	B	C	E	B	C	E	B	C	-7	8
OFF	PIN 6	17.2	7.2	15	.65	-	.67	.12	.65	.12	17.3	17.2	17.3
SLOW	PINS 6 & 8	16.5	7.2	15	.65	-	.67	.12	.65	.12	.78	16.8	0
FAST	PINS 6 & 7	16.5	7.2	6.7	7.3		.67	.124	.65	.124	16.5	0	16.6

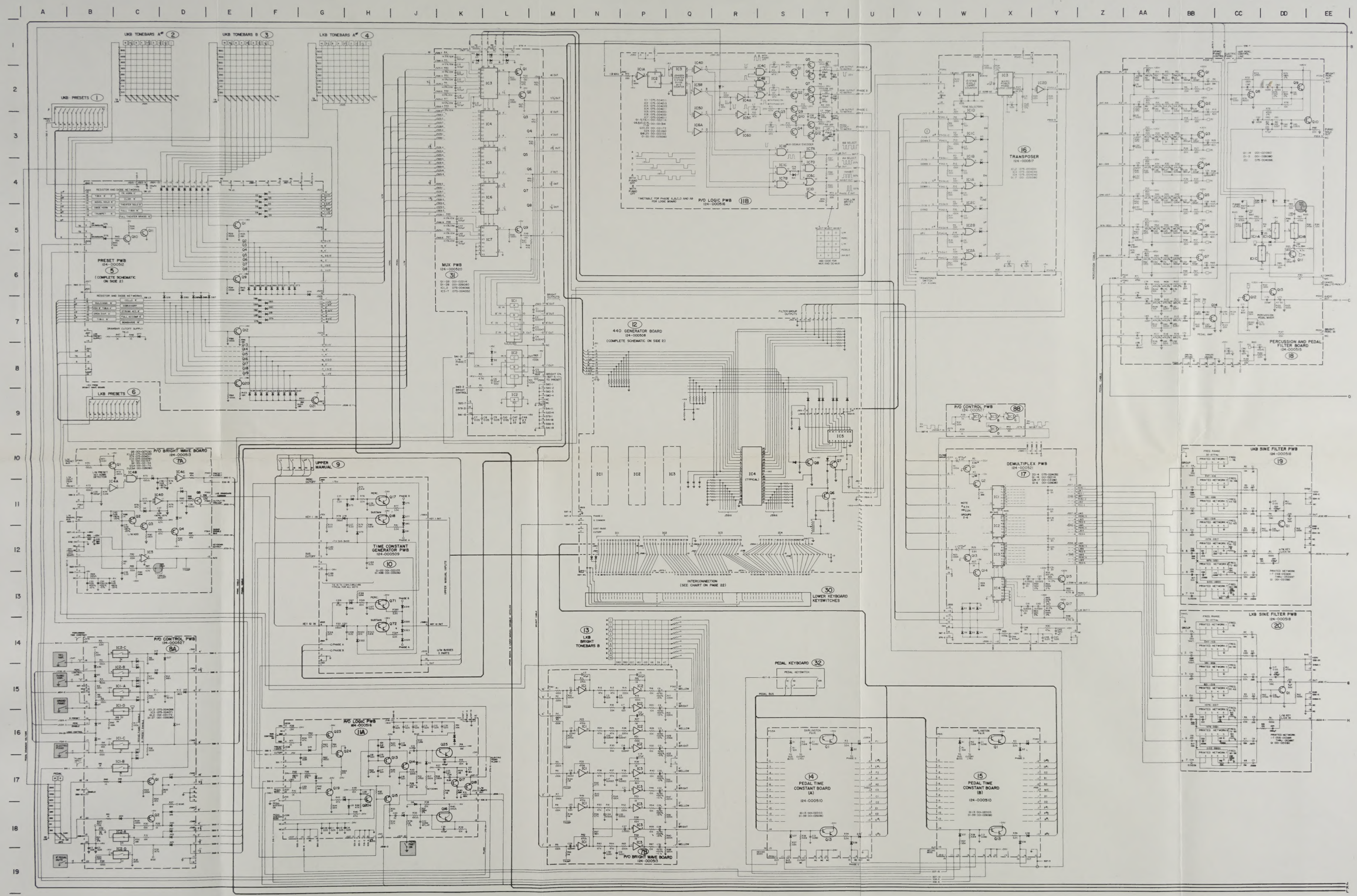


	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61
IC-1				Pin 12				Pin 18				Pin 24				Pin 13				Pin 19				Pin 25				Pin 14				Pin 21				Pin 26				Pin 15				Pin 22				Pin 27				Pin 16				Pin 23				Pin 28			
IC-2		Pin 12				Pin 18				Pin 24				Pin 13				Pin 19				Pin 25				Pin 14				Pin 21				Pin 26				Pin 15				Pin 22				Pin 27				Pin 16				Pin 23				Pin 28			
IC-3																														Pin 21				Pin 26				Pin 15				Pin 22				Pin 27				Pin 16				Pin 23				Pin 28			
IC-4	Pin 12				Pin 18				Pin 24				Pin 13				Pin 19				Pin 25				Pin 14				Pin 21				Pin 26				Pin 15				Pin 22				Pin 27				Pin 16				Pin 23				Pin 28				Pin 17
NOTE & OCTAVE	C 1	C# 1	D 1	D# 1	E 1	F 1	F# 1	G 1	G# 1	A 1	A# 1	B 1	C 2	C# 2	D 2	D# 2	E 2	F 2	F# 2	G 2	G# 2	A 2	A# 2	B 2	C 3	C# 3	D 3	D# 3	E 3	F 3	F# 3	G 3	G# 3	A 3	A# 3	B 3	C 4	C# 4	D 4	D# 4	E 4	F 4	F# 4	G 4	G# 4	A 4	A# 4	B 4	C 5	C# 5	D 5	D# 5	E 5	F 5	F# 5	G 5	G# 5	A 5	A# 5	B 5	C 6
U/M INPUT	J588-1	J587-1	J586-1	J585-1	J588-10	J587-6	J586-6	J586-6	J592-3	J587-11	J586-11	J585-11	J588-2	J587-2	J586-2	J585-2	J588-12	J587-7	J586-7	J585-7	J592-5	J587-12	J586-12	J585-12	J588-4	J587-3	J586-3	J585-3	J588-13	J587-8	J586-8	J585-5	J592-7	J587-13	J586-13	J585-13	J588-5	J587-4	J586-4	J585-4	J588-15	J587-9	J586-9	J585-9	J592-9	J587-14	J586-14	J585-14	J588-7	J587-5	J586-5	J585-5	J592-1	J587-10	J586-10	J585-10	J592-11	J587-15	J586-15	J585-15	J588-9
L/M INPUT	J574-8	J573-14	J572-14	J572-4	J574-14	J573-19	J573-4	J572-9	J574-19	J574-3	J573-9	J572-14	J574-9	J573-15	J572-20	J572-5	J574-15	J573-20	J573-5	J572-10	J574-20	J574-4	J573-10	J572-15	J574-10	J573-16	J572-21	J572-6	J574-16	J573-21	J573-6	J572-11	J574-21	J574-5	J573-11	J572-16	J574-11	J573-17	J572-22	J572-7	J574-17	J573-22	J573-7	J572-12	J574-22	J574-6	J573-12	J572-17	J574-12	J573-18	J572-25	J572-8	J574-18	J573-23	J573-8	J572-13	J574-23	J574-7	J573-13	J572-18	J574-13
PEDAL INPUT	J591A-1	J590A-1	J591-1	J590-1	J591-7	J590A-6	J591-6	J590-6	J591A-12	J590A-11	J591-11	J590-11	J591A-2	J590A-2	J591-2	J590-2	J591A-8	J590A-7	J591-7	J590-7	J591A-13	J590-12	J591-12	J590-12	J591A-3																																											

NOTE: THIS CHART SHOULD BE USED IN CONJUNCTION WITH THE GENERATOR BOARD SCHEMATIC ON SIDE 2 OF THE B3000 SCHEMATIC DIAGRAM.

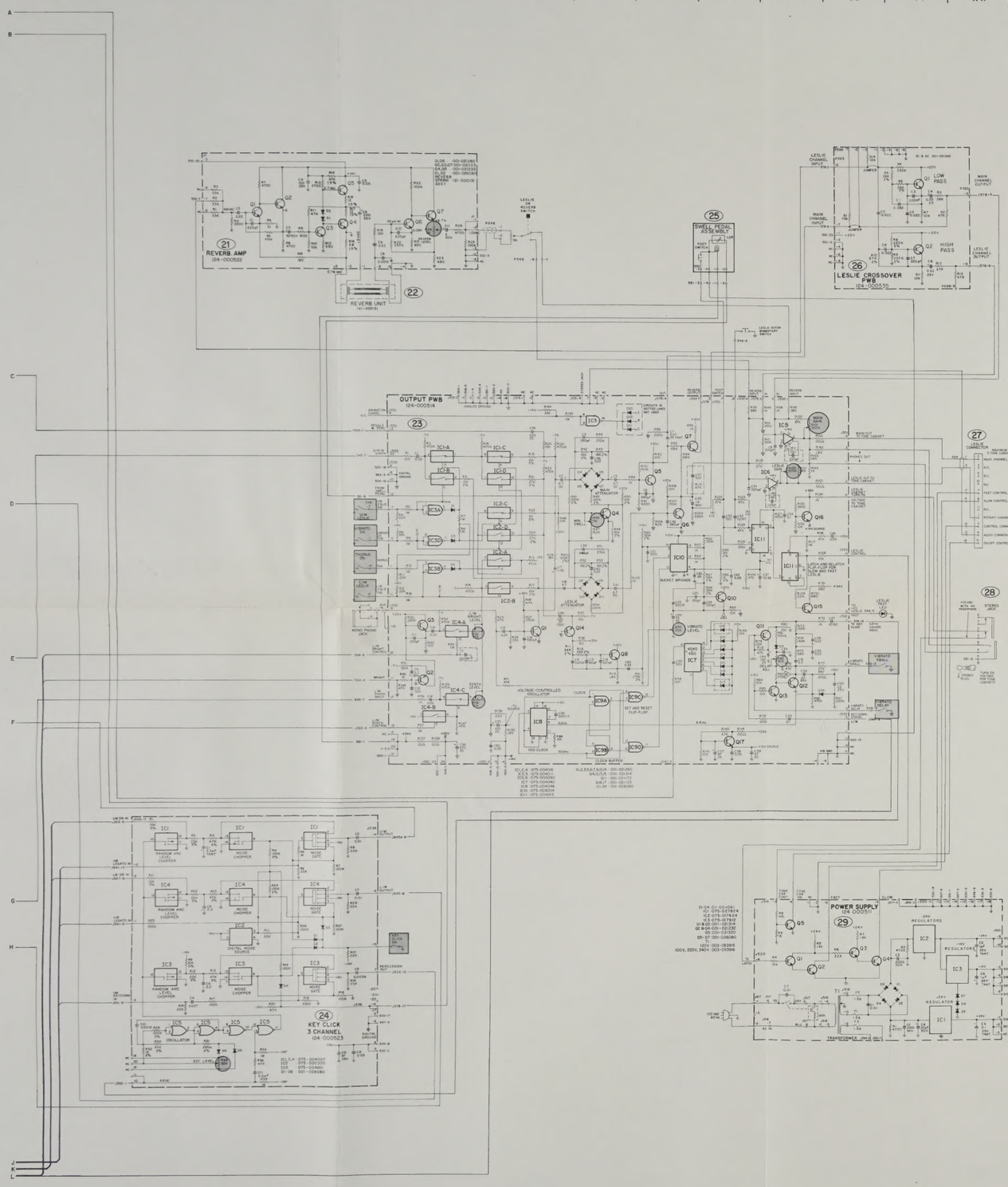
GENERATOR INPUTS CROSS REFERENCE CHART

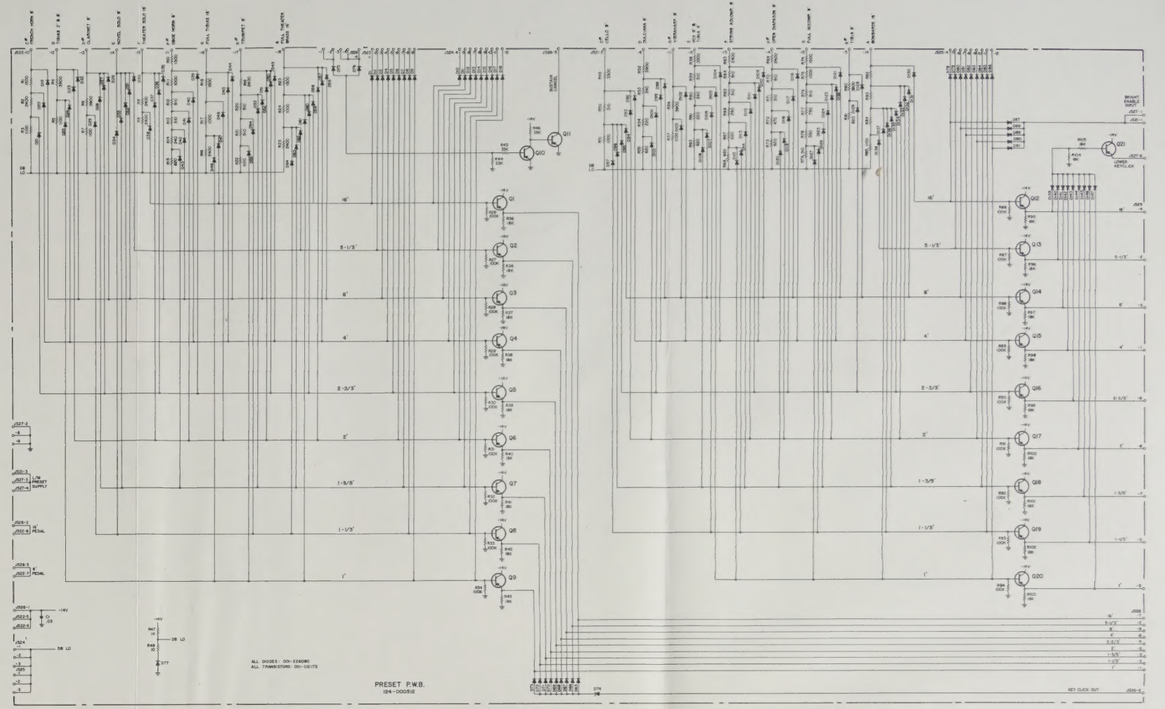
B-3000 SCHEMATIC DIAGRAM


UKB TONEBARS A# (2)
UKB TONEBARS B (3)
LKB TONEBARS A# (4)
UKB PRESETS (1)
PRESET PWB 124-000502 (5)
COMPLETE SCHEMATIC ON SIDE 2
LKB PRESETS (6)
MUX PWB 124-000520 (3)
P/O LOGIC PWB 124-000516 (11B)
TIMETABLE FOR PHASE A,B,C,D AND AB FOR LOGIC BOARD
16 TRANSPOSER 124-000517
PERCUSSION AND PEDAL FILTER BOARD 124-000515 (18)
12 440 GENERATOR BOARD 124-000508
(COMPLETE SCHEMATIC ON SIDE 2)
FILTER GROUP OUTPUTS
P/O CONTROL PWB 124-000527 (8B)
DEMULTIPLEX PWB 124-000521 (17)
UKB SINE FILTER PWB 124-000518 (19)
LKB SINE FILTER PWB 124-000518 (20)
P/O BRIGHT WAVE BOARD 124-000513 (7A)
UPPER MANUAL (9)
TIME CONSTANT GENERATOR PWB 124-000509 (10)
P/O CONTROL PWB 124-000527 (8A)
P/O LOGIC PWB 124-000516 (11A)
13 LKB BRIGHT TONEBARS B
P/O BRIGHT WAVE BOARD 124-000513 (7B)
PEDAL KEYBOARD (32)
14 PEDAL TIME CONSTANT BOARD (A) 124-000510
15 PEDAL TIME CONSTANT BOARD (B) 124-000510
INTERCONNECTION (SEE CHART ON PAGE 22)
30 LOWER KEYBOARD KEYSWITCHES

B-3000 SCHEMATIC DIAGRAM

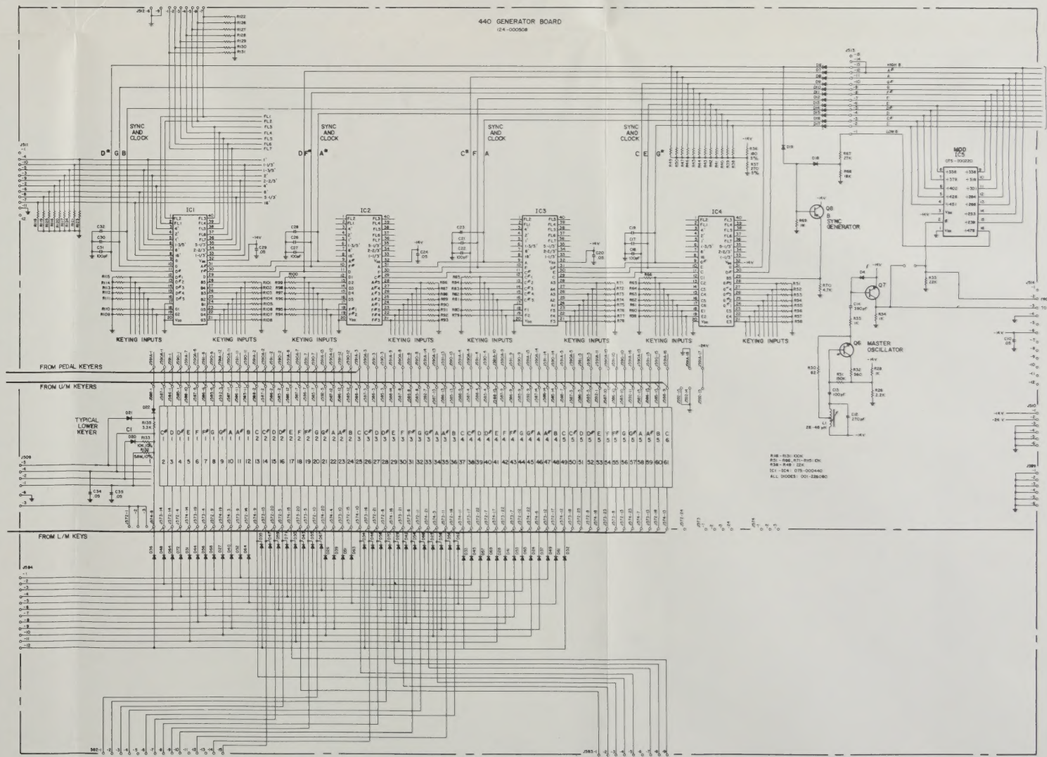
side 1





COMPLETE SCHEMATICS

ORGAN SCHEMATIC DIAGRAM ON REVERSE SIDE SHOWS ONLY PARTIAL SCHEMATIC DIAGRAMS



B-3000 SCHEMATIC DIAGRAM

3/81 side 2 U000 006090 SSS